

ABBESS INSTRUMENTS AND SYSTEMS, INC.



Abbess offers vacuum chambers, altitude and space simulation testing chambers, wide-range thermal (heating and cooling) systems, robotic systems, vacuum chambers that integrate cryogenic/refrigeration features for wide-range thermal cycling and testing and static set point control for biostorage. Abbess can deliver standard and custom single-stage or cascade refrigeration systems. The company's design, engineering and manufacturing capacity covers thermal dynamics, materials and heat transfer, touch-screen controllers with software, control algorithms and remote data interfaces. Abbess products are all designed and manufactured in-house. Its thermal vacuum test chambers are employed to ensure functionality when used in harsh environments such as satellites and other spacecraft. Founded in 1982, Abbess provides instruments and systems for science and industry. They serve a wide range of customers, including military and government laboratories, hundreds of universities, thousands of other customers all over the world, top industry research and development laboratories and manufacturing companies. <https://www.abbess.com>

ABILITY ENGINEERING TECHNOLOGY, INC.



For more than 70 years, AET has specialized in the design and fabrication of custom process equipment used in a variety of cryogenic and non-cryogenic applications. The company's products and services are used throughout the liquid-gas supply chain for the extraction, purification, liquefaction, distribution, storage and end use of gases and hydrocarbons. These include cryogenic purification and recovery systems for helium, hydrogen, and argon, vacuum insulated piping, valve boxes, distribution systems, extraction processing of oils, pilot plants, thermal shields, cryostats, cryogenic valves and bayonets. AET is an ASME-certified facility for the fabrication and repair of boilers and pressure vessels, and all work is done in accordance with the Code. The company's client base consists of industrial companies in diverse markets such as energy, food, pharmaceuticals, transportation, oil and gas, agriculture, petrochemicals and industrial gases, as well as government and academic institutions involved in scientific R&D. <https://www.abilityengineering.com>

ACME CRYOGENICS, INC.



Acme Cryogenics designs, manufactures, installs and services complete gas and fluid handling systems and equipment for the welding, medical, specialty, aerospace, cryo-bio, pharmaceutical, and electronic gases industries. Products include medical and industrial manifolds, vacuum insulated piping, gas blending (mixing) equipment, electrical controls, Acme and CVI cryogenic valves, specialty gas equipment, fabrication services, helium ISO containers and hydrogen tank rehab, vaporizers, and CGA fittings. Acme also offers design, manufacture and installation of vacuum insulated piping systems. Acme Cryogenics' national field service group provides services including installation, maintenance, and repair of all types of cryogenic and gas systems from coast to coast. Acme currently has four manufacturing operations: Allentown, PA; Atlanta, GA; Oxnard, CA; and Lonsdale, MN; and seven field service locations: Allentown, PA; Atlanta, GA; Houston, TX; Chicago, IL; Lonsdale, MN; South Plainfield, NJ; and Port St. Lucie, FL. <https://www.acmecryo.com>

AD-VANCE MAGNETICS, INC.



Ad-Vance Magnetics is an AS9100D & ISO 9001:2015 certified company specializing in room temperature and cryogenic magnetic shielding and precision sheet metal fabrication. Custom-fabricated magnetic shields from nickel alloys for aerospace, commercial, medical, military and scientific applications. Services include laser cutting, press brake forming, shearing, stamping, hydroforming, deep drawing, spot welding, heli arc welding, heat treating, machining and metal spinning. The company's experience and expertise make Ad-Vance Magnetics your one-stop job shop for simple components to complete assemblies, ranging from prototype parts to full production runs. No quantity is too small or too big. <https://www.advancemag.com>

ADVANCED RESEARCH SYSTEMS, INC.



ARS manufactures cryogenic equipment for applications and experiments - from quantum optics, to optical spectroscopy, to neutron scattering. ARS specializes in helium-free cryostats, flow cryostats, and cryogenic probe stations. The company's closed-cycle cryostats have a temperature range of 1.5 K to 350 K, and low vibrations between 3 and 5 nm at the sample, which makes ARS cryocoolers the equipment of choice for laboratory cryogenic applications. The ARS Helitran® Flow cryostats have atomic level resolution, making them ideal for SPM and STM. ARS has a full range of standard and custom probe stations with closed-cycle and flow cryostat options, both featuring 7T superconducting magnet options, optional nanometer vibration interfaces, and a temperature range of 1.5 K to 800 K. <https://www.arscryo.com>

AEROSPACE FABRICATION & MATERIALS, LLC



Aerospace Fabrication & Materials, LLC (AFM), is a manufacturer of multilayer insulation for spacecraft, launch vehicles and various cryogenic applications. The company's unique capabilities to cut, sew, tape and seal allow it to produce custom-built insulation to suit the customer's needs. AFM can produce parts from prints or custom-designed blankets to fulfill specified requirements, using 2D and 3D CAD software including AutoCAD, SolidWorks and ProE. Drawings can be converted to cut files for CNC cutting operations. AFM operates several clean rooms to meet project requirements. The engineering group at AFM continues to research and develop new fabrication techniques and new material combinations for lower cost and more efficient systems. The company's experienced staff of technicians performs on-site fit-checks and installations. AFM stocks a variety of thin films, foils and low conducting base products that can be combined to suit. AFM is ISO9001 and AS9100 certified. <https://www.aerospacefab.com>

Supplier Profile

AIR LIQUIDE ADVANCED TECHNOLOGIES



Air Liquide, a world leader in gases, technologies and services for industry and health, has locations in 75 countries with approximately 67,000 employees and serves more than 3 million customers and patients. In the field of cryogenics, Air Liquide provides custom and standard equipment and solutions, in particular those dedicated to scientific research, space and LNG industries, high temperature superconductivity, quantum computing and biogas and natural gas liquefaction and refrigeration systems, and manages cryogenic fluid storage and transportation. Air Liquide supplies some of the largest cryogenic installations

worldwide: CERN, KSTAR, ITER, JT-60SA, JLAB, SLAC, FNAL, SSRF, IBS and Ras Laffan site, Qatar. Air Liquide also offers high-end solutions for cryogenics of orbital systems. It provides cryogenic equipment and solutions for the European launcher Ariane, launch pads and space exploration. Air Liquide advanced Technologies is also involved in quantum computing and ultralow temperatures, providing dilution refrigerators and associated molecules like He3. <https://advancedtech.airliquide.com>

ALKEGEN



Lydall and Unifrax are now Alkegen. A global leader in cryogenic insulation systems, Alkegen offers unparalleled products and technical support. Alkegen is one of the few multilayer insulation (MLI) manufacturers with low temperature vacuum insulation testing capabilities and competence to provide expert advice on system design. The company's collated radiant barrier spacer system, CRS Wrap, applies up to four times faster than conventional insulation and significantly reduces waste. The CryoTherm family of 100 percent inorganic micro-fiberglass spacer materials has become the industry standard in MLI. Alkegen is also the exclusive global distributor of Cryo-Lite, a fiberglass blanket made of high quality, fine fibers bonded with a melamine resin. Cryo-Lite is designed for soft or hard vacuum applications and has many advantages over a Perlite system. All Alkegen cryogenic products are certified to meet DOT MC-338 (oxygen compatibility) requirements. <https://alkegen.com>

ALLOY VALVES AND CONTROL



Alloy Valves and Control, Inc. (AVCO) is a leader in innovative engineered ball valves and instrumentation devices for all fluid flow media and conditions in the piping process market. AVCO adheres to industry standards and pays attention to the details of each engineered component to provide a long-lasting and cost-effective solution. Products include full port 2- and 3-piece cryogenic ball valves from ¼" to 6", flow meters, restriction spools, orifice plates, and other fixed flow measurement devices. Valve options include v-port, diverter valves, different end caps, custom designs and full automation packages. Built to ASME B16.34, API 598 & API 607. Testing by BS6364 upon request. The company is ISO 9001:2015 and Woman-Owned registered. <https://avcovalve.com>

AMERICAN MAGNETICS, INC.



American Magnetics, Inc. (AMI), has been a manufacturer of superconducting magnet systems and cryogenic equipment for more than 50 years. Founded in 1968, AMI supplies turnkey cryogen-free and liquid helium-based superconducting magnet systems, with custom solutions ranging from completely conduction-cooled multi-axis systems combined with an integrated variable temperature insert to large-room temperature bore zero boiloff helium recondensing systems (Recon™). When AMI's innovative superconducting magnets, such as the multi-axis (MAXes™) series, are coupled with cutting-edge cryostats, the customer is

buying a winning combination. Topping off AMI's premier superconducting magnet systems is the Model 430 power supply programmer, which yields extreme accuracy, high automation and easy control for customers, all via Ethernet. AMI offers a complete line of capacitance- and resistance-based instrumentation that can be utilized to measure any cryogenic fluid with unparalleled accuracy and reliability. AMI stands behind its products with a warranty offering full system protection for 15 months. <http://www.americanmagnetics.com>

AMPO POYAM VALVES (AMPO)



Commitment made of steel

Ampo Poyam Valves (AMPO) is a world leader in highly engineered valves for the most severe applications, such as critical cryogenic valves in the temperature range for LNG or liquefied air gases, as well as for liquefied hydrogen or helium. Microflow control and shut-off valves from DN₂, vacuum or non-vacuum isolation applications are part of the valve portfolio. Axial check valves for vacuum and non-vacuum isolations are also available for liquefied hydrogen or helium, as well as top-load ball valves. Cryogenic He leak and pressure tests in LN₂ baths at 77 K are daily business to pursue the main activity with valves that can work in any field above 80K: Ball, gate, check, butterfly, globe valves from DN₂5 to DN₂500 and low pressure up to

2000-bar gas and 3000-bar hydro pressure. Custom solutions are a key part of the company's focus, including the delivery of integrated smart solutions as turnkey projects. <https://www.ampo.com>

AMUNEAL MANUFACTURING CORP.



Founded in 1965, Amuneal Manufacturing is a leading supplier of magnetic shielding for cryogenic and room temperature applications, with core competencies in low frequency magnetics, precision sheet metal fabrication and specialized hydrogen annealing. Amuneal currently employs over 70 engineering, production and project management/support staff, occupies more than 50,000 square feet in three adjacent facilities and provides advanced material, design, engineering, fabrication, testing and assembly services to customers worldwide. The company's continued growth has been driven by state-of-the-art 3D modeling

capabilities, advanced laser-cutting systems, Lean/JIT production management and in-house hydrogen annealing of fabricated magnetic shields. During design and prototype, Amuneal works extensively with customers on material selection and design considerations for optimum shielding performance. Shielding materials are highly sensitive to shock, and their molecular structure is affected by mechanical fabrication. To relieve mechanical stress and optimize the magnetic properties of the material, every Amuneal magnetic shield is hydrogen annealed after fabrication. <https://www.amuneal.com>

ARGONNE NATIONAL LABORATORY



Argonne National Laboratory (ANL) is a multidisciplinary science and engineering center managed by UChicago Argonne, LLC, for the US Department of Energy's Office of Science. At ANL, world-class researchers work alongside experts from industry, academia and other government laboratories to address vital national challenges in clean energy, environment, technology and national security. ANL was a pioneer in the development of low temperature superconductivity and its applications, including superconducting magnets for particle accelerators and beam lines, superconducting radio frequency cavities and large high energy physics particle detectors. ANL's diverse and dynamic research agenda spans 14 scientific divisions, 12 centers and six national user facilities, including the Advanced Photon Source, the Argonne Leadership Computing Facility and the Argonne Tandem Linear Accelerator System. This rich scientific environment provides researchers with an extraordinary range of cutting-edge facilities and scientific tools that support in-depth research, drive technological breakthroughs and improve the nation's competitiveness and quality of life. <http://www.anl.gov>

ATLAS TECHNOLOGIES



Atlas Technologies is a leader in hermetic bimetallic joining and aluminum vacuum. Atlas offers reliable cryogenic dissimilar metal couplings, flanges and fittings that are hermetic to ultrahigh vacuum (UHV). Atlas' bimetallic joining technology enables engineers to apply the properties of one metal seamlessly with that of another. For example, Atlas' transitions couplings are used in cryogen delivery lines where the low thermal conductivity of stainless steel transitions directly to the high thermal conductivity of aluminum. Many bimetallic combinations are available: Ti/SS, Ti/Al, Cu/Ti, etc. Atlas Technologies has also pioneered the use of aluminum ultrahigh vacuum. Atlas manufactures aluminum vacuum chambers and CF flanges which have a stainless steel knife edge and face bonded to an aluminum body for weld-up to an aluminum chamber. Atlas CF flanges enable engineers to utilize the outstanding properties of aluminum, such as low hydrogen, nonmagnetic, high thermal conductivity and light weight for reliable high performance vacuum. <https://www.atlasuhv.com>

BARBER-NICHOLS LLC



Barber-Nichols designs and manufactures vacuum jacketed, extended shaft centrifugal pumps, circulators, blowers and compressors for use with fluids at temperatures down to 2.6 K. These units minimize heat leak and are highly efficient, hermetically sealed and easy to service. Custom-engineered products are custom designed for integration into your specified system, and as a result, system performance is optimized. These features provide an extremely low total cost of ownership. Fluids include helium, hydrogen, nitrogen, oxygen, LNG and more. Select applications include the cooling of superconducting magnets, cycling of temperatures in satellite test chambers, pumping of liquid rocket engine propellants, cooling of synchrotron beamline crystals and processing of LNG vapor and transfer of cryogenics. <https://barber-nichols.com>

BEYOND GRAVITY AUSTRIA GMBH



Beyond Gravity is a leading European supplier of multilayer insulation for spacecraft and a global market leader of superinsulation for cryogenic medical systems. The experience gained in over three decades of thermal design and production enables Beyond Gravity to increase its customers' competitiveness with leading-edge technology solutions. Beyond Gravity, previously known as RUAG Space, has produced multilayer insulation for space applications since 1991 and has proven its competencies and skills in more than 80 spacecraft projects for customers including the European Space Agency and numerous other European programs. The company's expertise in the field of cryogenic insulation allows the development and production of cryogenic superinsulation for applications such as superconducting magnets, gas liquefiers, liquid gas tanks and infrastructure, superconducting cables, accelerators and more. The company's state-of-the-art manufacturing facility allows production on an industrial scale. Beyond Gravity Austria GmbH is certified to ISO 9001:2015, ISO 14001:2015 and EN 9100:2018. <https://www.beyondgravity.com>

BHIWADI CYLINDERS PVT. LTD.



Bhiwadi Cylinders is a leading manufacturer of static and transportable cryogenic pressure vessels and cylinders, along with vaporizers ranging from 200 to 100,000 liters. Products include static vertical tanks, liquid oxygen tanks, liquid nitrogen tanks, liquid argon tanks, liquid CO₂ and liquid nitrous oxide tanks, static horizontal tanks, transport tanks, mobile tanks, cryo-cylinders and LNG tanks. Capacity varies from 6,000 to 100,000 liters. <https://bhiwadicylinders.com>

BLUEFORS



Bluefors is a global market leader manufacturing cryogenic measurement systems, cryocoolers and other cryogenic product lines for quantum technology, fundamental physics research and other industries such as life sciences and clean energy. With several locations globally and around 600 employees, the company is dedicated to delivering the most reliable, versatile, and easy-to-operate systems on the market under the Bluefors and Cryomech brands. The quality of these products, in combination with its scalable production capabilities, has made Bluefors a preferred choice for ultralow temperature requirements at universities, research institutes, and corporations globally. <https://www.bluefors.com>

Supplier Profile

BRUGG PIPES



BRUGG Rohrssysteme GmbH designs, builds and supplies stainless steel flexible pipes made in Germany for 50 years and is a market leader in the area of transportation of flammable and water-polluting fluids. For cryogenic applications the company has designed, built and supplied stainless steel flexible pipes for 40 years. BRUGG supplies cryogenic flexible vacuum insulated pipes for all cryogenic gases in the range of 1/4 inch to 8 inches. Standard cryogenic products available in stock are FLEXWELL® cryo pipe in the dimensions from DN 15 to DN 40 and FLEXWELL® AiP VIP pipe specially designed for LNG gas stations. Other dimensions will be provided on a custom-made basis. <https://www.bruggpipes.com>

CANADIAN NUCLEAR LABORATORIES



Canadian Nuclear Laboratories is Canada's premier science and technology organization, with the scientific expertise to help solve some of the world's biggest problems. CNL has significant expertise in tritium handling, including the design of tritium removal systems from air and water and the use of cryogenic systems to concentrate tritium and store it as a metal hydride. <https://www.cnl.ca>

CCH EQUIPMENT CO.



CCH Equipment Co. has been serving the industrial gas industry with reconditioned equipment since 1977. The company specializes in cryogenic and industrial gas storage systems. With its inventory of over 1,000 vessels, CCH Equipment Co. can respond to customers' needs quickly. It can also provide field or shop design services. <https://www.cchequipment.com>

CHART INC.



Chart Industries, Inc. is a leading independent global manufacturer of highly engineered equipment servicing multiple applications in the energy and industrial gas markets. The company's unique product portfolio is used in every phase of the liquid gas supply chain, including upfront engineering, service and repair. Being at the forefront of the clean energy transition, Chart is a leading provider of technology, equipment and services related to liquefied natural gas, hydrogen, biogas and CO₂ capture, among other applications. The company is committed to excellence in environmental, social and corporate governance (ESG) issues, both for the company itself and its customers. With over 25 global locations from the United States to Asia, Australia, India, Europe and South America, Chart maintains accountability and transparency with team members, suppliers, customers and communities. <https://www.chartindustries.com>

CHASE RESEARCH CRYOGENICS LTD.



Chase Research Cryogenics designs and manufactures compact, self-contained and low-cost sub-Kelvin sorption coolers to support a wide and growing range of quantum technologies. The company has a strong emphasis on custom design to individual specifications and offers both single-shot and continuous cooling solutions. It specializes in systems working at 1 K, 300 mK and 100 mK and continues to innovate and extend its product range to offer simple, reliable operation in the sub-Kelvin temperature range. If a user is already working at liquid helium temperatures, whether with a mechanical GM/PT pre-cooler or a "wet" dewar pre-cooled with liquid cryogenics, the user can interface one of the company's sub-Kelvin coolers to their existing system and upgrade to the next level of cool. Chase Research Cryogenics also works closely with several reputable cryogenics companies that provide complete sub-Kelvin platforms incorporating its products. <https://www.chasecryogenics.com>

CLARK INDUSTRIES, INC.



Clark Industries, Inc. has over 40 years of experience in the manufacture and repair of high vacuum and cryogenic equipment. The company's standard products include several configurations of flexible helium transfer lines, fittings, manifolds and helium compressor adsorbers. Every Clark Industries product is manufactured with the highest quality and industry standards in mind. They always welcome every opportunity to quote customers' specialty designs and specifications, regardless of the size. <https://www.clarkind.com>

CO2METER, INC.



CO₂Meter, Inc., is identified as a leading source for gas detection, monitoring, and analytical solutions. Since 2006, CO₂Meter has continued to work diligently to utilize the latest, proven gas sensing technologies in order to solve the urgent needs of partners, customers, and professionals across the industry. By providing unique, high quality detection devices, analyzers, and sensors, CO₂Meter strives in each customer interaction to provide education about gas detection and monitoring, and to ensure the health, welfare, and safety of the public. The company's solutions encompass cryogenic, medical, scientific, indoor air quality, and many other additional environments. It is dedicated to delivering unique and custom solutions to its customers that exceed their technical and commercial requirements. CO₂Meter provides industry leaders, researchers, university professors, and engineers with world-class alternatives for a variety of environments and applications. <https://www.co2meter.com>

COAX CO., LTD.



Founded in 1974, Coax Company of Japan specializes in manufacturing semi-rigid coaxial cables. By using seamless metal tubes for outer conductors, Coax's cables can provide excellent performance in shielding and transmission. Customers can choose the best solutions for their applications from cables of various materials and sizes. Cryogenic cables are available in OD sizes between 0.33 mm and 3.58 mm, and are manufactured from stainless steel, cupronickel, beryllium copper, brass and phosphor bronze. Superconducting cables made with NbTi and Nb are also available in OD sizes between 0.86 mm and 2.19 mm. Coax can meet

requests for custom-order cables and cable assemblies with connectors (SMA, 2.92 mm, etc.) with a small minimum order quantity. <http://www.coax.co.jp/en>

COOLCAD ELECTRONICS



CoolCAD Electronics is a leading electrical test (current-voltage, capacitance-voltage, noise, transients, etc.) and compact modeling (SPICE) service provider for companies and agencies fabricating and/or designing electronics for operation at low temperatures.

Led by an experienced team of engineers and physicists, CoolCAD uses in-house cryogenic probing capabilities to characterize Si CMOS and other technologies for cryogenic operation. CoolCAD is also an expert in SPICE and compact model development for state-of-the-art technologies. The company has a long-running track record in measuring Si CMOS, and developing SPICE models at temperatures down to that of liquid helium, and in a wide temperature range from 4 K to 1,000 K. <https://coolcadelectronics.com>

CPC-CRYOLAB, AN MEC COMPANY



CPC-Cryolab, an MEC company, has been a pioneering designer and manufacturer of cryogenic valves and components in the industry for over 60 years. The diverse product portfolio of CPC-Cryolab and Rockwood Swendeman brands includes cryogenic manual, auto and control valves, cold-box valves, VJ manifolds, cryogenic filters, bayonets, fill extensions, fill and withdrawal manifolds, vacuum seal-off valves, vacuum jacketed hoses and fill hoses, safety relief valves, cryotrees and diverter valves. The company's products have been used in tens of thousands of systems across the globe, especially for liquid hydrogen service, and

have been in continuous operation for over 40 years without any incidents. CPC-Cryolab takes pride in providing durable solutions that abide by the highest standards of performance, safety, and environmental responsibility. <https://www.cpc-cryolab.com>

CREARE LLC



Creare LLC is a leading innovator in the design and development of custom cryogenic components and systems, including vacuum systems, heat exchangers, control systems, and turbo-Brayton and other cryocoolers. Creare develops systems with operating temperatures down to 4 K and cooling capacities ranging from a few milliwatts to several kilowatts. The company has designed and developed cryocoolers for long-life space missions and low-cost terrestrial applications. It provides complete cryogenic services from conceptual design, analysis and optimization to hardware development, fabrication and testing. <https://www.creare.com>

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CRIOTEC IMPIANTI SPA



Criotec Impianti designs and manufactures transfer lines, valve boxes, cryostats and custom environmental test chambers for extremely low temperatures (down to 10 K) to meet customer specifications and European standards, while providing maximum operational reliability. Customers include university and research laboratories, where the need for high technology is fundamental to the development of complex experimental apparatus. The company serves the aerospace industry with the design and manufacture of space simulation chambers, experimental test benches and technical gas distribution panels for space modules.

They also provide related equipment for pneumatic, hydraulic and helium leak testing. Criotec Impianti also designs and manufactures full turnkey systems equipped with their control system. They produce a range of systems, including liquid metal cooling systems, small liquefaction and re-condensation plants, radioactive gas sampling systems and test benches. <https://www.criotec.com>

CRYO INDUSTRIES OF AMERICA, INC.



With over 30 years of experience, Cryo Industries of America, Inc. is a leading supplier of cryogenic systems – standard or custom, open- or closed-cycle, continuous flow or reservoir type, He-4, He-3 and superconducting magnet systems. Innovative closed-cycle solutions include helium liquefiers, the Universal cryocooler and the Subcooled LHe. In the cryogen-free Subcooled LHe system, the refrigerator liquefies helium gas, and liquid helium is collected into a reservoir with an access

port that allows for insertion of various (interchangeable) inserts, including superconducting magnet inserts and variable temperature inserts. For initial system cooldown ~2-3 cylinders of helium gas are required, but once the system has cooled the helium gas is re-condensed within the system, creating a zero loss dewar. Subcooled liquid helium enhancements include additional field from superconducting magnets rated at 4.2 K, lower sample base temperature and increased cooling power. Gas handling system circulates cooling flow back into the dewar. <http://www.cryoindustries.com>

CRYO SERVICE LTDA.



Cryo Service Ltda. is an independent Brazilian company specializing in cryogenic services and MRI maintenance with its team of top engineers and technicians. The company also offers all types of cold heads and compressors ready for use and provides parts repair for cold heads, compressors and oil adsorbers in their modern facilities. With more than 20 years of experience, Cryo Service has served thousands of customers, servicing many different types of magnets, including GE, Siemens, IGC Philips, OMT and others, providing ice removal, correcting excessive consumption of liquid helium, leak testing with mass spectrometry, helium

liquid filling, high vacuum production and more. The company serves all of South America and has grown to be a top choice for excellent cryogenic services. <https://www.cryoservice.com.br>

Supplier Profile

CRYO TECHNOLOGIES



Cryo Technologies, a Chart Industries company, is a worldwide supplier of custom-engineered cryogenic process equipment, with a focus on helium systems. Products include cryogenic helium extraction systems for producing crude helium from pipeline natural gas, cryogenic purifiers for producing pure helium from crude helium, helium refrigerators and helium and hydrogen liquefiers covering a full range of sizes and applications, cryogenic and non-cryogenic gas purification and recycle systems for all gases, tritium removal systems and low-heat-leak vacuum insulated piping and distribution systems. Cryo Technologies' staff possesses over 150 cumulative years' experience designing and supplying custom-engineered cryogenic helium systems to the gas industry and scientific community. As an extremely efficient technology company, Cryo Technologies offers unique process equipment and systems at highly competitive prices. <https://www.chartindustries.com/Businesses-Brands/Cryo-Technologies>

CRYOCO LLC



CRYOCO LLC provides exceptional cryogenic training and consulting services, offering courses in: Cryogenic Engineering and Safety, Liquid Nitrogen, Liquid Hydrogen, Liquid Oxygen, Liquid Natural Gas (LNG), Methane, and custom-built courses to meet your needs. Educating small-scale and large cryogenic technologies for 40 years, CRYOCO helps manufacturers keep personnel knowledgeable on cryogenics, reviews design changes, performs facility inspections, and offers expert consulting. CRYOCO trains those of all backgrounds, degreed and non-degreed technicians, and travels to provide courses at your facilities for your staff.

The most popular and comprehensive course is the Cryogenic Annual 5-Day Summer Course, held in Golden, Col. in August each year. Instructors are fully knowledgeable in ASME codes and standards for PVC Section VIII, Div 1 and Div 2, Pressure Vessel construction and ANSI/ASME B31.3 Process Piping and CRYOCO is fully compliant with OSHA, U.S. Federal HCS, and CFR1910. <https://www.cryocourses.com>

CRYOCOAX



CryoCoax specializes in the design and manufacture of RF cryogenic interconnect products. As a dedicated division of the Intelliconnect group, CryoCoax continues to go from strength to strength, providing cryogenic solutions to some of the biggest tech companies in the world. By combining decades of industry experience with innovative business practices, the company remains one of the most respected interconnect companies in the industry. It is renowned for customer support and reliability, consistently high-quality products and flexibility. CryoCoax's products have capabilities to withstand temperatures to 2 K and

below and include niobium titanium cable/cable assemblies to 40 GHz, cupro nickel cable/cable assemblies to 40 GHz, stainless steel cable/cable assemblies to 40 GHz, beryllium copper cable/cable assemblies to 40 GHz, non-magnetic cable/cable assemblies to 40 GHz, 2.9 mm + SMA adapters, solderless 2.9 mm + SMA connectors, sealed adapters, hermetic connectors and adapters, attenuators, low temperature hardware and SMP/SMPM connectors, high density connectors, box build and stick assemblies. <https://www.cryocoax.com>

CRYOEDGE™



CryoEdge offers cryogenic treatment services to increase the usable life of cutting tools and wear parts for a wide variety of applications. While a number of core customers benefit from the treatment of bandsaw blades, cold saw blades, drill bits and other cutting tools, the process also strengthens industrial and automotive parts, including brake drums and rotors, as well as various products made of carbide and other ferrous and non-ferrous metals. CryoEdge uses a proprietary process that transforms metal at the molecular level. The result is a tool metal that is often several times more durable than untreated metal, saving significant

costs through extended usable life, greater productivity and safer work environments. Because the CryoEdge process has proven value in the performance of firearms, the company has partnered with longtime security consultant/supplier Advisor Tactical Products to serve that industry's needs. The process also improves the durability of synthetics like nylon, Delrin®, and HDPE. <https://www.cryoedge.com>

CRYOFAB, INC.



Cryofab, Inc., manufactures and services cryogenic equipment and accessories. Custom as well as standard fabrications depict the product mix. Customizing ability allows Cryofab to offer ASME, DOT, and ANSI products. Cryofab's in-house engineering can assist in product development for OEM or private label fabrication in either prototype or production runs. Manufacturing capabilities include, but are not limited to, double wall vacuum vessels, tanks and containers, chambers, pressure vessels, cold gas generators, cold traps, transfer lines, metal hose fabrications and VJ manifolds. Cryofab offers a full line of cryogenic vacuum jacketed valves

for VJ piping, tanks, trailers, cold boxes and transfer systems as well as bayonets and vacuum seal-off products. Manufacturing capabilities range in size from five liters to 7,500 liters. Founded in 1971, Cryofab has grown simply on the merits of its innovative products and superior service. <https://www.cryofab.com>

CRYOGAS TECH SDN BHD



Cryogas Tech S/B is a proven service provider specializing in cryogenic liquid and gas applications for the food and beverage, pharmaceutical and semiconductor industries. The company's cryogenic solutions are backed by 20 years of experience and knowledge in the field of aseptic and ultrahigh purity process technologies, providing a cost-efficient and trouble-free cryogenic system for customers' related process needs. Products include cryogenic fuel lines, cryogenic piping, environmental test chambers, filling and transfer systems, LN₂ dosing systems, phase separators, subcoolers and transfer lines. Technical services include process

and economic impact analysis for each application; system design, engineering and component selection; equipment manufacturing; turnkey system supply, installation and commissioning; and post-commissioning services such as system upgrade, maintenance and repair. <http://www.cryogas.asia>

CRYOGENIC INSTITUTE OF NEW ENGLAND, INC.



cleanly and cost-effectively remove unwanted machine burrs or mold flash from manufactured parts. Equipment sales are also available.
<https://nitrofreeze.com>

The Cryogenic Institute of New England offers a full range of cryogenic processing services for industry, including deep cryogenic treatment of metals and other materials, cryogenic deflashing of molded parts, cryogenic deburring of machined metal and plastic parts, cryogenic material separation for recovery and waste stream separation, thermal cycling for military and aerospace applications, shrink fitting services and other cryogenic parts processing needs. Cryogenic metal treatment alters the microstructure of steels and relieves residual stresses in all metals for improved performance. Cryogenic deburring and deflashing

CRYOGENIC LIMITED



that operates from 1.6 K to 1,000 K. Interchangeable measurement options include: vibrating sample magnetometer, AC susceptibility, specific heat, resistivity and Hall effect probes with sample rotation. Cryogen-free Helium-3 (280 mK) or dilution refrigerator modules (<10 mK) are available for experiments at lower base temperatures. A 7 Tesla cryogen-free SQUID magnetometry system is available for magnetic property measurements. <https://www.cryogenic.co.uk>

Cryogenic Limited has supplied thousands of superconducting magnets to the scientific community over more than 20 years, relying on the team's 200+ years of experience in the design and engineering of superconducting magnet systems. Cryogen-free magnets and measurement systems are available with fields up to 20 Tesla. Configurations include solenoids, split pair, vector and beam-line magnets. Turnkey systems require no liquid helium for operation: simply switch on the cryocooler compressor and the system will be operational in 12-48 hours. The Cryogen Free Measurement System has an integrated variable temperature insert

CRYOGUARD LLC



CRYOGUARD™

and premixed epoxy adhesives during shipping, storage and handling. As the indicators provide an at-a-glance warning of thermal exposure via color change, they can provide a hassle-free alternative to data loggers and verify compliance with the guidelines of FDA, CDC, and CAP for shipping/storing heat sensitive medications and specimens. <https://cryoguard.com>

Cryoguard LLC provides indicators that monitor thermal exposure at 10 preset "signal" temperatures from -5 °C down to -150 °C. Indicators irreversibly change color from green to red within 0.5-2 hours at their signal temperature and within minutes at 10 °C above their signal temperature. At 25 °C below their signal temperature indicators remain green; thus users can tell in an instant that the monitored material was never compromised by thermal exposure. Cryoguard indicators are widely used to assure the quality of cryopreserved eggs, sperm, cord blood, embryos, bone marrow, stem cells, bone grafts, blood plasma, vaccines, biologics

CRYOMAGNETICS, INC.



CRYOMAGNETICS, INC.
 INNOVATIVE TOOLS FOR SCIENTIFIC RESEARCH

liquid cryogen-free systems with integrated VTI (C-Mag), recondensing, and custom designs. Cryomagnetics' team of certified fabricators assures high construction quality with ASME certification available. Built to handle the unique demands of superconducting magnets, the true four-quadrant Model 4G power supplies provide outstanding performance and standard features. The Model LM-510 may be configured as single/dual channels or recondensing controller. Also offered is the Model 620 (2 channel/4 channel) temperature monitor. System accessories include sample measurement options, VTIs, He-3 inserts, HTS or duty-cycle optimized current leads, LHe and LN₂ sensors, temperature sensors and more. <https://www.cryomagnetics.com>

Cryomagnetics, Inc., is a leading manufacturer of superconducting magnets and magnet systems. Cryomagnetics' engineering strikes a careful balance between rugged design and low charging currents, allowing for smaller cryocooler use (dry) or less helium consumption (wet). Solenoidal, split or multi-axis designs are available in standard and high field configurations. In-house manufacturing capabilities include ultralow loss cryostats,

CRYONOVA PROCESS SYSTEMS, LLC



Cryonova helium compressors is ideally suited to refrigeration and liquefaction systems in the 12-22 gram per second range. The compressor includes a highly innovative and efficient oil removal system and a state-of-the-art control system, has a small footprint and operates quietly. This compression system can be customized to suit helium refrigeration or liquefaction plants. <https://cryonova.com>

Cryonova manufactures and services helium compression systems, helium refrigerators, helium liquefiers and helium purifiers. The company supplies parts, service and consultation to helium cryogenic operations around the world, including the US Army and Navy, universities, government laboratories, aerospace facilities and other prominent locations. Cryonova supplies custom control systems, mechanical upgrades and repairs, custom control programming and plant maintenance on existing cryogenic plants. Also, emergency on-site service is available to ensure continuity of operation during critical test cycles. The CC series of

CRYOSPAIN



Cryospain is a family-owned private company operating in the field of design, engineering, manufacturing, construction and after-sales services of static equipment for the cryogenic industry. Its headquarters are located in Pinto, near Madrid, Spain. The company operates a secondary workshop in Getafe, Madrid and has a subsidiary in Texas. Cryospain develops non-standard customized solutions, and the main activity of the company includes: low pressure cryogenic tanks for storage of LIN/LOX/LAR/LNG in the range from 500 to 15000 m³, vacuum insulated/jacketed piping solutions and accessories as well as other pipe-in-pipe solutions, cold box extensions and vacuum insulated valve boxes, and vacuum insulated pressurized storage tanks for storage of liquid hydrogen (500 m³) <https://cryospain.com>

Supplier Profile

CRYOSRV, LLC



CryoSRV is an independent MRI cryogenic parts and service organization focused on providing a high value alternative for re-manufactured parts, innovative service solutions, and the peace of mind resulting from its unique remote magnet monitoring solution. The company offers an extensive repair and test process that ensures unmatched quality and reliability. Its range of products includes coldheads, compressors, adsorbers, cold traps, helium flexlines, chillers, and remote magnet monitors. Services include onsite magnet cryogenic service, in-house cryogenic repair facility, remote magnet monitoring, consulting and phone support. <https://www.cryosrv.com>

CRYOTECHNICS LLC



CryoTechnics LLC specializes in low temperature thermometry and cryogenic devices for medical equipment, aerospace propulsion, liquefied natural gas, cryopump technology, superconductivity and quantum computing. The company employs innovative design and manufacturing strategies that enable it to support both legacy systems and state-of-the-art applications with high quality and cost-effective products and solutions. The team at CT possesses a broad range of research and product development skills, with decades of experience in not only cryogenic technology but also specialty packaging, process design and instrumentation. CT is committed to providing the high level of service and customer satisfaction made possible by a small, highly knowledgeable, and motivated staff of scientists and engineers. <https://www.cryotechnicsus.com>

CRYOVAC LOW TEMPERATURE TECHNOLOGIES



CryoVac low temperature technologies, established in 1975 near Cologne, Germany, is a leading supplier of customized cryogenic and low temperature systems for various research and industrial applications. CryoVac offers a broad range of cryogenic equipment, open- or closed-cycle (dry) systems, bath systems or continuous flow setups for variable temperature as well as low temperature setups. All systems are custom; all design, engineering, machining and mounting is done in-house and allows for various options for customers and fast response to specifications. Design and engineering of systems are done in close cooperation with the customer. Starting from the first idea and initial design, the customer is part of the process to ensure the best solution for their experiment or application. Furthermore, CryoVac offers services such as cryogenic consulting, performance of feasibility and design studies, maintenance and repair, and cryogenic measurements and treatments performed in high-end cryogenic systems. <https://www.cryovac.de>

CRYOWORKS, INC.



From a simple flex hose to an entire complex piping system, CryoWorks provides a wide range of products for the storage, distribution and transfer of cryogenic fluids. CryoWorks specializes in simple to complex system design, engineering services, project management, service, and turnkey installations. Components include flexible and rigid vacuum insulated piping systems (meets ANSI B31.3 Process Piping Code), dynamic and static vacuum piping systems, hybrid systems, vacuum insulated transfer hoses, valves, manifolds, vacuum chamber valve boxes, bulk supply tanks, vaporizers, phase separators, controls, bayonets, field joints, keepfulls, vent heaters, reservoirs, LN₂ dosers/injectors, temp chambers, e-stop valves, and oxygen sensors. The industries the company serves are aerospace/defense, alternative fuel (LH₂), beverage/container, cryoscience, deflashing, electronics/semiconductor, entertainment/special effects, food freezing/tunnels, HALT/HASS, industrial gas plants (ASU), medical, Molecular Beam Epitaxy (MBE), research, solar, transportation (LNG), OEM and universities. Tight schedule? Tight budget? CryoWorks will work hard to meet any requirements. <https://cryoworks.net>

CRYOWORLD BV



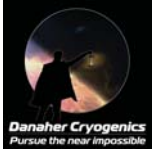
Cryoworld BV in The Netherlands is a specialist in advanced engineering and fabrication of cryogenic projects. Its core business is the development, design, production, testing and site installation of helium, nitrogen, hydrogen and other custom-designed cryogenic equipment. Cryoworld specializes in the development of new cryogenic technologies and delivers projects to renowned companies and scientific institutes worldwide. Dedicated engineers and specialists make sure every project meets high quality standards. The company serves scientific institutes and universities, high-tech production industries, pharmaceutical industries and research projects. Cryoworld provides advanced systems for cryogenic applications, with fields of expertise including customized systems for liquid nitrogen, helium and other cryogenic liquids, for example: valve boxes for liquid helium, liquid helium transfer lines, cryogenic pressure vessels, cryostats, cryogenic processes and equipment, temperature, level and pressure sensors and controls and custom-built valves. <https://www.cryoworld.com>

CSIC PRIDE (NANJING) CRYOGENIC TECHNOLOGY CO., LTD.



CSIC Pride (Nanjing) Cryogenic Technology Co., Ltd. (Pride Cryogenics) is a technology oriented company concentrated on the development and manufacturing of cryocoolers and cryogenic engineering application devices. Pride Cryogenics' products include 4K/10K/77K GM cryocoolers, cryopumps, helium purifiers, helium reliquefiers and liquefiers, dilution refrigerators and customized cryostats. <http://www.724pridecryogenics.com/en>

DANAHER CRYOGENICS



Founded by Charlie DanaHER, formerly of High Precision Devices, DanaHER Cryogenics offers a wide range of cryogenic solutions, from high-performance, high-efficiency pulse tubes to full cryostat systems, serving quantum, astronomy, etc. Recently, DanaHER began partnering with Chase Research Cryogenics, offering fully integrated cryostats hosting legendary Simon Chase coolers. Options include single-shot and continuous 1 K coolers; single-shot and continuous 300 mK; and continuous 100 mK systems. Additionally, DanaHER Cryogenics represents Leiden Cryogenics in North America. Leiden Cryogenics is a world leader in high-power dilution refrigerators. Leiden systems offer low-vibration, high cooling power, and push-button operation. Leiden's 4-spindle lift design allows the system to be opened and closed with a single user, without the need for a floor pit. DanaHER Cryogenics is not simply a supplier of cryogenic solutions, but a partner in your important project. If you don't know what you're looking for, DanaHER will help you figure it out. <https://danaHERcryo.com>

DEMACO HOLLAND BV



Demaco is an expert in the field of cryogenic technology. The company builds infrastructures to facilitate the transport and application of industrial gases at extremely low temperatures (between -160 °C and -271 °C). Demaco offers turnkey solutions, beginning at the very first concept: offering support from the initial conceptual sketch, detailed planning, engineering, manufacturing, delivery, assembly, supervision, commissioning to maintenance, and all necessary documentation. Demaco works together with research institutes, universities, industry, and space organizations all over the world on a wide variety of prestigious

projects, including the transport and conditioning of liquid nitrogen, liquefied natural gas, and the design and manufacturing of advanced systems for liquid helium and hydrogen. <https://demaco-cryogenics.com>

DMP CRYOSYSTEMS, INC.



Durable Metal Products, Inc., dba DMP CryoSystems, is an industry leader in the design and manufacture of cryogenic treatment equipment and accessories. The design intent focuses on providing dependable production throughput. Combining tempers and freezers in one machine removes multiple handling operations. Fully programmable controllers with multi-segment recipes ensure repeatable results in every batch. The product line includes top-loading chest, front-loading swing and guillotine-door style models with one of the widest temperature spans in the industry (-300 °F to 1,200 °F), enabling the company to satisfy present and

future customer needs as market requirements change. Additionally, all DMP CryoSystems' processors can be custom designed to fit into existing production lines, whether loaded manually or with a charge car, a capability that permits uninterrupted cohesive material handling. DMP CryoSystems' line of products (CryoFurnace, CryoTemper and CryoSwitch) can be found in operation all over the world in both captive and independent heat treat shops servicing every industry. <https://www.cryosystems.com>

EPSIM CORPORATION



EPSIM provides engineering, subject-matter expert, and process consulting services on various client applications, from air separation to custom cryogenic applications, ASU operations baseline analysis, maritime regulatory compliance, and operation safety reviews. EPSIM's services include online reports of plant performances that are intuitive and actionable, with spreadsheet downloads, to inform clients' maintenance and operations. EPSIM also provides energy management and wholesale electric market participation services. With its thorough understanding of air separation plant operations, EPSIM can develop customized

strategies for power cost reduction. <https://www.epsim.us>

EQUIGAS, INC.



Equigas, Inc. has been dedicated to the distribution of gas equipment since 1985, providing impeccable service, high-quality products and customer-minded warranties. Its world-class service is tailored to meet the individual needs of customers worldwide. Some of the brands Equigas stocks are: RegO Products, Goddard, Superior, Bestobell Parker, Powell Valves, Sherwood, FasTest, NoShok, DK-LOK, Cash Acme Emerson, Oseco, Jomar, Apollo Valves, Smart-Hose, Acme Cryogenics and CEXI, Blackmer, Flowserve, CIMC-ENRIC, FIBA and more. Contact them for any of the following products: cryogenic globe valves, gate valves,

safety valves, diverters, rupture discs, regulators, adapters, cryogenic pumps and CO₂ pumps, high pressure cylinder valves, high pressure fast filling connectors, pressure gauges, ball valves, safety check hoses, cryogenic and CO₂ hoses, cryogenic bulk tanks, cryogenic microbulks, vaporizers and more. Equigas takes pride in loving what they do and serving their customers with passion. <https://www.equigas.net>

ESSEX INDUSTRIES



Essex Industries has been designing, building and supporting cryogenic storage and distribution systems since 1963. The company's core competency centers around equipment that needs to operate in extreme environments, providing systems used as the primary life support system for military transport, cargo and fighter aircraft. Essex also offers a line of fixed and rotary wing liquid oxygen systems for air and ground ambulances, mass oxygen distribution systems and LOX systems for the home health care industry. In addition to converter systems, the company manufactures liquid oxygen generators and liquefaction devices, 50

and 500 gallon LOX storage carts and a variety of tanks, valves, disconnects and accessories. Essex offers complete repair, overhaul and maintenance service on over 25 different styles of LOX converters, including systems originally produced by other LOX system manufacturers. <https://www.essexindustries.com>

Supplier Profile

ETA SPACE



Eta Space is an industry leader in efficient cryogenic fluid management technology for space and hydrogen energy applications. The company is at the forefront of in-space propellant resupply, ISRU, and active and passive thermal management for applications of minimizing heat leak and managing heat flow. Services include design, analysis, development, and operation of propellant storage and liquefaction systems and LOX and LH₂ densification units. Eta Space can provide cryogenic test facilities, thermal vacuum chambers, cryogenic propellant storage and distribution needs, and hydrogen liquefiers from 15 L per day to one ton per

day. In thermodynamics and heat transfer, the letter eta is a symbol of efficiency. Eta Space engineers are ready to assist any cryogenic need as efficiently as possible. <https://etaspace.com>

FABRUM



Fabrum provides technical solutions in cryogenic applications incorporating cryocoolers, production systems, cryostats, hydrogen production and liquefaction, specializing in the development and delivery of membrane cryocooler technology. These range in size from 450W to 10kW and can be configured as cryocoolers or reliquefiers. These systems utilize either pulse tube or Stirling cold heads. This patented cryocooler technology provides superior performance in addition to world leading multiple-year service

intervals. Fabrum is a New Zealand company delivering technically advanced and innovative composite engineering solutions, producing components for a range of products, including superconducting transformers, magnets and cryostats, and composites for cryogenic containment and cooling systems in power systems equipment and other magnetic systems. Fabrum is an ideal development partner for customers' HTS, LTS or cryogenic liquefaction and cooling projects. <https://fabrum.nz>

FACILITY FOR RARE ISOTOPE BEAMS – MICHIGAN STATE UNIVERSITY



The Facility for Rare Isotope Beams (FRIB) is a user facility for the U.S. Department of Energy Office of Science (DOE-SC), supporting the mission of the DOE-SC Office of Nuclear Physics. DOE-SC, Michigan State University (MSU), and the State of Michigan funded FRIB's establishment. The DOE-SC Office of Nuclear Physics supports user facility operation. Hosting what is designed to be the most powerful heavy-ion accelerator, FRIB enables scientists to make discoveries about the properties of rare isotopes, nuclear astrophysics, fundamental interactions, and applications for society. MSU's nuclear physics graduate program is ranked No. 1, according to U.S. News & World Report, and about 10 percent of the nation's nuclear science PhD holders are educated at MSU. The MSU Cryogenic Initiative is a partnership between FRIB and MSU's College of Engineering to educate and train the next generation in cryogenic engineering through classroom education and training on leading technologies at FRIB. <https://frib.msu.edu>

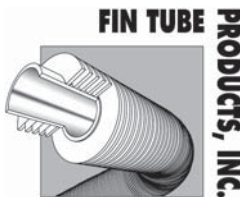
FERMI NATIONAL ACCELERATOR LABORATORY



Fermi National Accelerator Laboratory is America's premier laboratory for particle physics and accelerator research. Fermilab is operated for the US Department of Energy's Office of Science by the Fermi Research Alliance, LLC, a partnership of the University of Chicago and the Universities Research Association, Inc. Cryogenic technology plays a major role in Fermilab's research. Laboratory scientists, engineers and technicians are experts in designing, building and operating superconducting magnets and have worked with industry to build, for example, superconducting magnets for the Large Hadron Collider at the European

laboratory CERN. Fermilab is the US leader in the development of superconducting radio frequency cavities, which need to operate at cryogenic temperatures, to power particle accelerators. The lab also uses cryogenics in neutrino, particle astrophysics and quantum computing research. The international Deep Underground Neutrino Experiment, hosted by Fermilab, will feature particle detectors filled with 70,000 tons of liquid argon at -184 °C. The laboratory built a 520-megapixel CCD camera for the Dark Energy Survey, which is cooled to -100 °C, to provide researchers with a clear picture of our expanding universe. It also helped build the Super Cryogenic Dark Matter Search experiment, which operates at tens of millikelvin. <http://www.fnal.gov>

FIN TUBE PRODUCTS, INC.



Fin Tube Products, Inc., is a manufacturer of helically wrapped finned tubing for the heat transfer industries, with finned tubes generally ranging in size from 2" OD down to .016" OD. The smaller sizes (mini or hypodermic) are used in medical cryostats and some military applications, generally in conjunction with a JT (Joule-Thomson) port. The smaller sized tubing can be supplied with up to 142 fins per inch and the attachment, depending on tube and fin size, can be either soldered or brazed. The brazed finned tubing service from Fin Tube Products, Inc. creates a metallurgical bond between the tube and fin, making it the most suitable bond for higher temperature applications. FINBRAZE ® bonding between the tube and the fin ensures a stress-free, uniform, and non-porous contact. This bonding allows for thinner tube walls compared to a welded fin to tube joint. The FINBRAZE process is done in-house with the company's controlled atmospheric brazing furnace. <https://www.fintube.com>

FORMFACTOR



As a leader in cryogenic test and measurement, FormFactor enables the emerging quantum industry and other scientific applications with a lineup of solutions for the full lifecycle of R&D, production, and deployment: cryogen-free, dilution refrigerators capable of 20 uW at 20 mK and base temperatures < 6 mK ADR (adiabatic demagnetization refrigerator) and helium-3 cryostats; semi- and fully-automated cryogenic probe stations for highly-parallel electrical and optical probing of socketed dies, bare dies, and full wafers from 50 mm up to 300 mm; and high density electrical probe sockets and probe cards for combined RF and DC

test in cryogenic systems. <https://www.formfactor.com/products/quantum-cryo>

GARDNER CRYOGENICS



Gardner Cryogenics develops, designs and manufactures high quality storage tanks, tank containers and trailers for liquid helium and hydrogen. The company provides custom equipment, cryogenic piping, helium process systems, liquid hydrogen tank systems, purifiers, storage vessels and complex vacuum jacketed piping to maintain temperatures close to absolute zero. Gardner specializes in meeting the rigorous demands of liquid helium and hydrogen customers, with high performance equipment backed by expertise. Value to customers derives from reliable equipment that assures long-term, energy-efficient and cost-effective performance; exceptional heat leak performance, with some equipment designed for 0.008 BTU/hr/ft² (.0000025 watts/cm²) – among the lowest in the world; tank containers that provide the longest hold times and highest liquid yields available; patented “transient shield” technology; a commitment to world-class quality confirmed by early receipt of ISO 9001 certification; manufacturing facilities featuring internationally recognized expertise in precision welding, insulation and vacuum technology; and a team of multidisciplinary cryogenics experts. <https://www.gardnercryo.com>

GAS EQUIPMENT COMPANY, INC.



Gas Equipment is a world leader in sales of cryogenic, industrial gas, LNG and CO₂ transfer and control equipment. Its comprehensive product range for the industrial gas industry and LNG market is focused on cryogenic trailers, tanks, gas delivery systems and fill plants. Specific product areas include cryogenic regulators, cryogenic globe, gate and check valves, manual and automated cryogenic ball valves, precision turbine flow meters and electronics. Teflon and stainless steel flexible hose and safety hoses, medical and CO₂ ball valves, safety relief valves, bulk tank and liquid cylinder gauges are also part of its range. Liquid CO₂ pumps and compressors, gas plant/cryogenic equipment, pressure and flow control devices for liquid and gas service are included in the company's offerings. <https://www.gasequipment.com>

GENH2 CORP.



GenH₂ is a premier provider of liquid hydrogen infrastructure solutions. The company mission is to advance the renewable energy economy by accelerating the hydrogen infrastructure buildout. The GenH₂ team of scientists and engineers possess decades of experience researching, engineering, and producing hydrogen solutions for the US DoD, DoE, NASA and leading universities. GenH₂ aims to mass produce mid-size modular systems to support a variety of end-use cases for land, air, sea and space. GenH₂'s products are designed to be flexible and scalable and controlled by an integral central processing capability for a new generation of safe, reliable liquid hydrogen-based solutions. The company is rapidly expanding and intends to be a key player in the clean energy future. <https://genh2hydrogen.com>

IC BIOMEDICAL



Capitalizing on a 65-year legacy of cold chain storage and transport technology, IC Biomedical brings new life to the cryogenic equipment market. Formed by a merger of well-established providers International Cryogenics, Inc. and Worthington's Life Sciences Cryogenic Equipment Group (formerly Taylor-Wharton CryoScience products), IC Biomedical builds high-quality cryogenic storage and transport systems for the global biomedical research and development, health care, biorepository, pharmaceutical, biotechnology, IVF and animal husbandry semen markets. All products are made in the US at the company's new medical-grade manufacturing facility in Cartersville, Georgia. Aluminum vessels include dewars, small freezers (extended time and high-capacity models), and laboratory systems for vial storage and vapor shippers. Stainless steel high-capacity freezers include the LABS and K-Series lines. By uniting with the best global distribution network, sourcing from trusted, high-quality suppliers and using the knowledge earned through decades of industry innovation, IC Biomedical is the future of cryogenic storage and transport. <https://icbiomedical.com>

IMTEK CRYOGENICS



IMTEK Cryogenics stands as a premier cryogenic engineering firm at the industry's vanguard. They offer innovative solutions to intricate cryogenic challenges, presenting energy-efficient cryogenic plants and storage systems for sectors like IVF, dermatology, cryotherapy, and more. Having introduced pioneering concepts such as the portable stand-alone cryoplant, they continually redefine industry standards. Their dedication to R&D has fostered advancements like enhancing cryoplant efficiency and reducing LN₂ costs. Their state-of-the-art ultraprecision lab produces components with remarkable precision, showcasing the company's commitment to quality. Not merely industry participants, Imtek Cryogenics is an innovator, with their products driving scientific discovery. Their collaboration with research institutions underlines their role in scientific progress. With a firm dedication to sustainability, they remain steadfast in their vision to revolutionize the world through cryogenic technology. <https://www.imtekcryogenics.com>

INDEPENDENCE CRYOGENIC ENGINEERING (ICE)



ICE is a unique company made up of a group of diverse individuals with over 120 years of combined experience in the operation, maintenance and repair of cryogenic refrigeration systems. ICE specializes in the repair and reconditioning of cold heads, cryopumps, helium compressors, activated carbon oil adsorbers and other ancillary devices. It also carries a line of self-sealing gas flex lines and vacuum jacketed transfer lines. While the bulk of its business involves ICE in the medical imaging community, the company is pleased to offer its services to the vacuum, aerospace, integrated circuit and cryogenic industries. Craftsmanship and concern for detail have made ICE a leader in the field. Let ICE help your organization maintain the same high level of excellence. <https://weareice.com>

Supplier Profile

KELVIN INTERNATIONAL CORPORATION



The Kelvin International Corporation produces cryogenic equipment for military, semiconductor, and the bio-archive markets. Its product line includes LN₂ and LOX plants along with high pressure nitrogen (HPN₂) systems. KIC manufactures high pressure service trailers for ship tender support and offshore platforms. A custom product line of cryogenic level sensors and lab monitoring systems is available to automate labs and filling stations. <https://www.kelvinic.com>

KEYCOM CORPORATION



KEYCOM has 30 years of experience in the field of ultralow temperature and superconductivity, providing cryogenic cables and components to more than 200 research institutes worldwide since 1992. KEYCOM has developed NbTi-NbTi superconducting cables and cryogenic semi-rigid coaxial cables for a variety of applications recognized by various research institutions and dilution refrigerator suppliers all over the world. KEYCOM can also offer low noise amplifiers (LNA) and Bias-Tees for cryogenic use at various frequencies. <https://keycom.co.jp/eproducts/upj/top.htm>

KIUTRA GMBH



kiutra has established itself as a supplier of innovative cryogenic solutions, products and services. The company designs and builds turnkey cryostats providing both standard one-shot and multi-stage continuous Adiabatic Demagnetization Refrigeration (cADR) – an elegant technique for permanently generating sub-Kelvin temperatures. Because of their cryogen-free magnetic cooling principle, kiutra's cryostats provide fast, simple and sustainable cooling to temperatures below 1 K, independent of

helium-3. By using stray-field compensated ADR magnets, optional mu metal shielding and precise temperature control, kiutra cryostats enable highly accurate measurements even of very sensitive samples. <https://kiutra.com>

LAKE SHORE CRYOTRONICS, INC.



For more than 50 years, Lake Shore Cryotronics has been committed to its customers' pursuit of the science that benefits mankind. Starting with cryogenic temperature sensors, Lake Shore is now an industry leader in cryogenic temperature measurement for the research market, and has used this success to grow into other adjacent research areas. Lake Shore now provides everything from full turnkey research platforms for research techniques such as VSM measurements, Hall measurements, and other electrical transport experiments to system subcomponents needed to build or adapt your own system. This includes environmental aspects such as temperature and magnetic field measurement and control, to various electrical sample measurements such as conductivity, mobility, and IV relationships. Lake Shore has a global network of highly skilled scientists, engineers, and technicians on staff to provide customer support in order for researchers to make the discoveries that continue to push the scientific world forward. <https://www.lakeshore.com>

LIHAN CRYOGENICS CO., LTD.



Lihan Cryogenics (LC) was co-founded by Lihan Technologies and Technical Institute of Physics and Chemistry (TIPC) of the Chinese Academy of Science in 2007, located in Shenzhen, China. Based on 20 years of thermoacoustic research in TIPC, and more than ten years of development of the linear motors and control electronics technology in LC, Lihan Cryogenics is committed to the professional design, manufacturing, and commercialization of cryogenic cryocoolers (including Stirling cryocoolers and pulse tube cryocoolers) and providing tailored solutions for user applications. LC has developed and manufactured a series of cryogenic cryocoolers with the lowest temperatures ranging from 10 K to 200 K, and cooling capacity ranging from milliwatt to kilowatt level. It is the only manufacturer in China to export cryogenic cryocoolers in batches. Lihan's products are widely used in infrared imaging, nuclear detection, environment monitoring, high temperature superconductivity, the biomedical industry and gas liquefaction, etc. <https://www.lihan.com>

LINDE CRYOGENICS, DIVISION OF LINDE ENGINEERING AMERICAS



Linde Cryogenics, a division of Linde Engineering Americas, and Linde Kryotechnik AG are members of the Linde Engineering Division of Linde plc. With over 80 years of experience, Linde provides process plants for low temperature helium and hydrogen refrigeration and liquefaction. The Linde product line includes small capacity systems with piston-expander technology or gas-bearing turbine-expander technology and world-class custom plants with turbine technology. Linde's cryogenic engineering and manufacturing centers are located in Tulsa, OK and Pfungen, Switzerland. Linde has supplied cryogenic plants and systems to premier research institutions and industrial gas companies worldwide. <https://www.leamericas.com/en/technologies/deep-cryogenics/index.html>

MAGNATROL VALVE CORPORATION



Established in 1936, Magnatrol Valve Corporation is an industry-leading manufacturer of high quality, two-way bronze and stainless steel solenoid valves designed to provide rugged, durable service with unsurpassed reliability. Over the years, the company has grown to serve a wide range of industries and original equipment manufacturers involved with fluid process control. In the cryogenic marketplace, Magnatrol offers customers a choice of bronze (Type L and M) and stainless steel (Type J and K) solenoid valves designed to handle liquid oxygen (-297 °F), argon (-303 °F) and nitrogen (-320 °F). These valves are available to fit pipe sizes from 3/8" up to 3" depending upon the model, are fully tested, degreased and cleaned to keep them free of moisture and are backed by complete product support, service and on-time delivery. <https://www.magnatrol.com>

MAGNETIC SHIELD CORPORATION



Since 1941, Magnetic Shield Corporation has specialized in the engineering, fabricating, and testing of custom magnetic shields. CRYO-NETIC® is the company's proprietary nickel-iron soft magnetic alloy that is ideal for shielding unwanted magnetic fields at cryogenic temperatures. Many high energy physics research applications are conducted under cryogenic temperatures, but still require shielding. The permeability of Magnetic Shield's MuMETAL® and Co-NETIC® alloys begin to decline at -40 degrees, which is why the company offers CRYO-NETIC® magnetic shielding alloy for increasing permeability with decreasing temperature. Upon receipt of your requirements, Magnetic Shield Corporation's technical team can review your design, provide valuable input and modeling, and fabricate your shield. As an ISO 9001 certified supplier, the company will provide manufactured parts, made to your specifications. Magnetic Shield is a diverse company, offering a broad range of production capabilities and solutions including cutting, machining, stamping, forming, welding, and annealing. <https://www.magnetic-shield.com>

MARATHON PRODUCTS, INC.



Marathon is a leading designer, manufacturer and distributor of cryogenic LN₂ and -80 °C temperature data logging sensors. Their portable display devices and data collectors are widely used by companies in the semiconductor and life sciences for GMP and stability studies. The company's single use -80 °C loggers are often the last QC gate before epoxies, laminates, adhesives and slurries are used to manufacture integrated circuits. Today many blood banks, research hospitals, and stem cell laboratories monitor cellular activities using Marathon's digital sensors. <https://marathonproducts.com>

MEYER TOOL & MFG., INC.



Meyer Tool & Mfg., Inc., specializes in the design and manufacture of cryogenic, vacuum and pressure equipment for scientific and commercial applications. This includes prototypes as well as production quantities, unique systems, subsystems, assemblies and components. Products include, but are not limited to, custom cryostats, cryogenic storage dewars, cold box fabrication, coil-wound heat exchangers, vacuum chambers, UHV chambers and ASME pressure vessels. Meyer's specialized prototype development capability translates well into high quality, high value custom fabrication applications. Meyer offers fully integrated capabilities – design engineering, fabrication, machining, assembly and testing. Industries served include accelerator applications, biotechnology, solar, industrial gas, petrochemical, semiconductor and communications. <https://www.mtm-inc.com>

MICRO HARMONICS CORPORATION



Micro Harmonics Corporation (MHC) produces a line of millimeter-wave Faraday rotation isolators designed for cryogenic use. These isolators have the lowest insertion loss, broadest bandwidth and smallest form factor in the industry. The cryogenic isolators are currently available in WR-15 (50-75 GHz), WR-12 (60-90 GHz), WR-10 (75-110 GHz), WR-9 (82-122 GHz), WR-8 (90-140 GHz), WR-6.5 (110-170 GHz) and WR-5.1 (140-220 GHz). Additional bands are under development. The isolators have been successfully tested down to 1 K. Comprehensive thermal stress modeling and thermal stress testing is performed to ensure the components can withstand repeated cryogenic cycling. <https://www.microharmonics.com>

MIDALLOY



Midalloy provides alloy-welding consumables for manufacturers and fabricators serving the cryogenic industry. These stainless steel and nickel alloy grades join base metal components for cryogenic conditions. They meet AWS, ASME, DFARS, and other applicable specifications. Grades provided in stainless steel are Midalloy 308L LF (low ferrite) and Midalloy 316L LF (low ferrite), in nickel alloys, Midalloy NiCrMo3 (626) and Midalloy NiCrMo4 (276), and all in flux-cored or bare wire versions. Also offered are stainless grades pretested at -320 °F. with certified mechanical test reports and a full line of fluxes for submerged arc welding. Founded in 1985, the company focuses on the specialty, high alloy, and technical niches of the welding industry. We guarantee exact chemical compositions and traceability from melt to final product. Product ships from St. Louis and Houston locations. Midalloy also provides technical advice and consulting from its certified experts with degrees in welding engineering. <https://www.midalloy.com>

MOLECULAR PRODUCTS, INC.



Molecular Products, Inc., is a manufacturing firm that provides leading technologies for gettering applications and orthohydrogen to parahydrogen conversion. Gettering: IONEX-type Ag 400 is an X-type silver zeolite that is a highly efficient getter material used in the vacuum annulus of cryogenic containers, panels or transfer lines. Ag 400 will remove gaseous hydrogen, which slowly outgasses from the steel container shell into the vacuum space, in order to preserve ultrahigh vacuum levels. Ag 400 is a high-quality, cost-effective option for gettering applications. Orthohydrogen to parahydrogen conversion: The IONEX-type O-P Catalyst is an unusually effective catalyst for converting orthohydrogen to parahydrogen. It facilitates reliable, continuous production of liquid hydrogen with a high parahydrogen content. The necessity for additional, expensive refrigeration equipment to absorb the heat of conversion at the storage site is eliminated since liquid parahydrogen is transferred to storage directly from the liquefier where the catalysis takes place. <https://www.molecularproducts.com>

Supplier Profile

NASA KENNEDY CRYOGENICS TEST LABORATORY



The Cryogenics Test Laboratory, located at NASA Kennedy Space Center, is a consortium for the research, development and application of cross-cutting technologies to meet both industry and government needs. It provides cryogenic expertise, materials research, prototype design, experimental testing and technical standards development for technology products with research institutions and commercial partners. With the theme of energy-efficient cryogenics, the Cryogenics Test Laboratory helps to solve problems in the power, transportation, refrigeration, medical, construction, manufacturing and aerospace sectors.

Technology focus areas include thermal insulation systems (from 4 K to 400 K), integrated refrigeration systems, advanced cryofuel storage and transfer systems (LH₂, LO₂, and LNG), novel materials and low temperature applications. Its objective is to develop new technology and implement engineering know-how for energy-efficient storage, transfer and use of cryogenics on Earth and in space. https://csabg.org/contact_info/nasa_ksc_cryogenics

NATIONAL HIGH MAGNETIC FIELD LAB – FLORIDA STATE UNIVERSITY



The Magnet Science and Technology Division of the National High Magnetic Field Lab is one of the leading organizations worldwide in the design and construction of high performance magnet systems and components. Flagship magnets at their facility in Tallahassee, Fla. include the 45-T resistive-superconducting hybrid magnet, a 105-mm bore high-resolution 900-MHz NMR magnet and 35-T resistive magnets. NHMFL has developed resistive and superconducting magnet systems for laboratories in the US and abroad, including, among others, a large-gap superferric dipole magnet for nuclear physics at the National Superconducting Cyclotron Lab at Michigan State University and a 25-T hybrid magnet for neutron scattering at the Helmholtz Zentrum Berlin. <https://nationalmaglab.org>

NIKKISO CRYOGENIC INDUSTRIES



Nikkiso Cryogenic Industries, Inc., a member of Nikkiso Co. Ltd, with its affiliates and subsidiaries, has over 50 years of experience in design, custom-engineered solutions, sales and service of cryogenic machinery, process systems and heat transfer equipment, reciprocating and centrifugal pumps, turbo expanders, vaporizers, air separation plants, LNG liquefiers and systems, cryogenic and gas processing equipment and engineered solutions/service. Its Clean Energy and Industrial Gases group consists of Heat Exchanger Systems (Cryoquip), Process Systems (Cosmodyne), Integrated Cryogenic Solutions, Services and Cryogenic Pumps

group (ACD, Nikkiso Cryo). With offices and service centers in 11 countries on four continents, they provide an international presence while being able to respond locally. As cryogenic technology becomes increasingly vital, Nikkiso Cryogenic Industries continues to develop and provide quality products and services globally. From its headquarters in Temecula, CA, Nikkiso Cryogenic Industries' network offers the manufacturing, marketing and services the industrial gas, petrochemical and new energy industries expect. <https://www.nikkisoceig.com>

NIOWAVE, INC.



Niowave was founded in 2005 by former National Superconducting Cyclotron Laboratory researcher Terry Grimm and a group of private investors. Since then, it has become a worldwide leader in the research, development, manufacturing, and operation of superconducting electron linear accelerators as stand-alone sources and to produce medical and industrial radioisotopes. Niowave's highly skilled workforce was built by combining the scientific and technical expertise from nearby world-class universities, national laboratories, and the strong manufacturing industry in Mich. In the company's state-of-the-art facilities,

Niowave produces multiple medical radioisotopes that are used to treat cancer. This isotope production is achieved by their in-house production, testing, and operation of complete accelerator systems and cryomodules, accelerating cavities and components, electron guns / injectors, cryogenic helium refrigerators, microwave power sources and niobium and niobium alloys. Niowave has performed over 100 cryogenic tests on over 25 different superconducting cryomodules at its two Lansing, Michigan facilities since 2007. <https://www.niowaveinc.com>

OAK RIDGE NATIONAL LABORATORY



ORNL is the leading DOE national laboratory in high temperature superconducting (HTS) applications, including Superconductivity Partnership with Industry projects in the areas of HTS cables, transformers, fault current limiters, motors and generators. As part of these projects, ORNL provides technical expertise in the integration of cryogenic cooling systems with the HTS conductor elements as well as quench and stability, AC-loss and other studies of HTS conductors and coils. Included in this R&D program is the optimization of cryogenic cooling systems for these emerging technologies. ORNL is also involved with cryogenic R&D for

DARPA, ONR and NASA. The laboratory is also performing leading edge R&D in the area of cryogenic dielectric materials, including the design of dielectric systems that operate at high voltages in the temperature range of 20-80 K. <https://www.ornl.gov>

OMEGA FLEX, INC.



Omega Flex, Inc.'s metal hose products are used extensively in factories such as steel mills, chemical and petrochemical plants, pulp and paper mills, power plants, water and wastewater facilities. They are also used for cryogenic applications, vacuum jacketed hose applications, LNG and CNG fill and transfer hoses, CGA-440 oxygen hose applications, and cargo/chlorine transfer lines. <https://www.omegaflex.com/omegaflex>

OXFORD CRYOSYSTEMS



Oxford Cryosystems is a market leading manufacturer of low temperature devices. The company made history designing the first open-stream cooler, the Cryostream (80-500 K), which quickly became the system of choice for sample cooling. Its product range has since expanded to include cryogen-free systems such as the Cobra (80-500 K) and N-Helix (28-300 K), alongside a specially adapted system for powder diffraction, the PheniX (12-290K). The variable-speed Gifford-McMahon coldheads housed in these products are also available separately, operating at speeds of 40-90 rpm. Their single-stage coldhead range includes the 0/12 and 0/40, respectively delivering cooling powers of 12 and 40 W at 77 K. The two-stage coldhead range includes the 2/9 and 6/30 models, some of the smallest GM coldheads available, both delivering base temperatures of 10 K. Alongside Oxford Cryosystems' K450 Helium Compressor, these devices are used in a wide range of applications from superconducting magnets to radio astronomy. <https://www.oxcryo.com>

OXFORD INSTRUMENTS NANOSCIENCE



Oxford Instruments NanoScience designs, supplies and supports market-leading research tools that enable quantum technologies, new materials and device development in the physical sciences. Its tools support research down to the atomic scale through the creation of high performance, cryogen-free, low temperature and magnetic environments. The tools are based upon the company's core technologies in low and ultralow temperatures, high magnetic fields and system integration, with ever-increasing levels of experimental and measurement readiness. The key product range includes cryogen-free continuous cooling solutions for millikelvin devices, Triton dilution refrigerators for quantum computing applications, OptistatDry top- and bottom-loading optical cryostats for spectroscopy, superconducting magnet systems, cryogenic measurement systems and custom engineered systems. Oxford Instruments NanoScience is a part of the Oxford Instruments plc group. <https://nanoscience.oxinst.com>

PENFLEX



Penflex, established in 1902, manufactures flexible metal hose, corrugated and interlocked, as well as metal expansion joints. Known for their durability and resistance to corrosion, Penflex products are well suited for transfer of cryogenic liquids and gases. With a focus on continuous improvement, Penflex offers additional services such as failure analysis and specialized welder training leading to ASME Sec IX certification. With standard and highly customized products, Penflex offers a broad range of solutions for flexible piping products along with world-class manufacturing processes, quality programs and customer service. With large stocks, Penflex can supply bulk hoses immediately and custom-built hoses and expansion joints quickly after approval. In addition, Penflex has its own subsidiary located in Vietnam for service to the Asia Pacific markets or for supply chain solutions where longer lead times are acceptable. <https://www.penflex.com>

PHOTON SPOT INC.



Photon Spot manufactures sub-Kelvin cryogenic systems and superconducting nanowire single-photon detectors (SNSPDs) for top research groups around the world. The company's SNSPDs exhibit ultralow dark counts, sub-100ps jitter, and >90% quantum efficiency near 1550nm. Their detectors are used for free-space optical communication, quantum optics experiments, and linear optics quantum computing. Photon Spot's fully automated, closed-cycle cryostats use a helium sorption fridge to provide temperatures below 1K (-272 °C, -457 °F). Their cryostats are a cost-effective alternative to ADRs or dilution fridges, getting to 800mK with helium-4 and 400 mK with helium-3. Their cryostats can house up to 64 SNSPDs (each with individual fibers, coaxes, and electronics), or a detector array with free-space optical access and vibration-reducing fixtures. Photon Spot also manufactures cryostats that offer very low temperature oscillations (~3 mK at 4 K with a 500 mW load). These cryostats are used for cooling down Josephson junction arrays for quantum-based voltage standards. <https://www.photonspot.com>

PHPK TECHNOLOGIES



PHPK Technologies is a premier supplier of cryogenic and high vacuum equipment to the North American market. The company's extensive engineering and fabrication services, combined with a complete line of cryogenic globe valves, bayonets, seal-offs, vacuum jacketed piping and the CVI TorrMaster cryopump provide customers with unique capabilities. PHPK's engineers, designers, technicians and skilled craftsmen have extensive welding and fabrication experience, giving customers high quality and value for their successful projects, along with extremely professional and knowledgeable service. As an ASME Boiler and Pressure Vessel (B&PV) Section VIII, Divisions 1, 2 and 3 (U1, U2, U3) Code approved facility, PHPK provides pressure vessels, high vacuum chambers, cryostats, vacuum cold boxes, warm He compressor skids, LN₂ pumping skids, thermal shrouds, thermal conditioning units (TCUs) and many other custom-designed products for particle accelerators, superconducting, space simulation, aerospace and efficient cryogenic cooling through process control. <https://www.phpk.com>

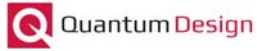
PRINCETON CRYOTECH



Princeton CryoTech, founded in 1990, specializes in the design, sales, startup, and service of cryogenic distribution and storage systems, including vacuum insulated storage equipment, piping, manifolds and bulk tanks. Princeton CryoTech operates Princetoncryo.com, offering direct sales of vacuum insulated freezers, dewars and shippers, as well as a wide array of accessories and components relating to cryogenic storage. Princeton CryoTech also operates Deep Cryo, offering secure on-site cryogenic storage of biological materials, and tracked and temperature monitored cryogenic shipping services. As the company keeps its eye on the future of cryogenics, it is working with some of the brightest minds in space research to tackle cryogenic flow solutions in space. Princeton CryoTech is your one-stop shop for all things related to cryogenics services and equipment. The company takes pride in its technical experience, its customer service and its ability to help solve any problem that comes its way. <https://princetoncryo.com>

Supplier Profile

QUANTUM DESIGN, INC.



Quantum Design is a leading manufacturer of automated material characterization systems for physics, chemistry, and material science research communities. Systems provide temperatures from 0.05 to 1,000 K and magnetic fields up to 16 tesla. The company's Physical Property Measurement Systems (PPMS®, DynaCool®, and VersaLab®) provide a wide range of measurements, including magnetometry, electrical transport, heat capacity, thermal expansion, FMR, and thermal transport. The SQUID-based Magnetic Property Measurement System (MPMS®3) is the industry standard for ultrasensitive magnetic measurements. All measurement systems are available as cryogen-free versions. Quantum Design also manufactures advanced helium liquefiers (NexGen 160, NexGen 250), configurable helium recovery systems, an innovative low-vibration magneto-optical cryostat (OptiCool®), and an award-winning correlative AFM/SEM microscope platform (FusionScope®). The company distributes Scanning NV and Kerr microscopes, FMR spectrometers, single crystal furnaces, quantum education kits demonstrating quantum entanglement, sub-Kelvin optical cryostats and rapid-cooldown C-ADR sub-Kelvin cryostats. <https://qdusa.com>

REGO



The RegO® and Goddard brands offer premier lines of cryogenic gas flow and control products. With over 110 years of experience, the RegO and Goddard brands are relied on by the industrial gas and liquefied natural gas industries for valves, regulators, pressure relief devices and other cryogenic gas equipment. The product lines are utilized in bulk cryogenic vessels, liquid transportation trailers, cryogenic liquid cylinders, bulk plant/ASU construction and gas fuel systems. RegO and Goddard brand products are supported by a global network of distributors and company locations in the United States, Mexico, Germany and Asia. <https://www.regoproducts.com>

RIX INDUSTRIES



RIX manufactures low vibration, no maintenance, highly reliable, acoustic Stirling (pulse tube) cryocoolers for applications requiring up to 1,000 watts of cooling at 77 K. Each unit is driven by two of RIX's renowned linear reciprocating motors with clearance seal pistons, providing wear free operation with no lubrication required. The dual opposed motor/piston design within the pressure wave generator (PWG) is naturally balanced, reducing vibration and noise. RIX's designs are completely absent of cold moving parts or seals, eliminating maintenance that is required of most other technologies. When mass loading at the cooled point is of concern, RIX offers a flexibly attached remote (FAR) system, separating the PWG from the coldhead, which further reduces vibration. These advantages are accompanied by competitive pricing in both small and large quantities, making them ideal not only for laboratory use but also for HTS, medical, liquefaction, and military applications. <https://www.rixindustries.com>

ROCKWOOD COMPOSITES LTD.



Rockwood Composites has significant expertise in the application of prepreg composite materials in the cryogenic industry, ranging from suspension bands to high voltage, high-stress insulation systems. Glass and carbon bands are manufactured from prepreg materials rather than the traditional method of filament winding. This results in superior mechanical properties and quick production rates, making these bands the ultimate cost-effective solution for primary suspension. The company's molded products are used extensively where strength, as well as thermal and electrical isolation, is required. Many components have embedded thermal pathways and film insulation. Electrical insulation is provided on bonded structure and coil winding. Rockwood's design and engineering capability enables the company to provide customers with innovative products and unique manufacturing solutions. Short lead times from concept to hardware are provided through in-house design, tool manufacture and test facilities. Rapid problem-solving and exceptional customer support are backed by EN 9100 2018 and ISO 9001 2015 quality manufacturing systems. <http://www.rockwoodcomposites.com>

RUTHERFORD & TITAN INC.



A nationwide cryogenic installation and servicing company, Rutherford & Titan is a specialized network of cryogenic engineers and consultants. The company has deep experience in the cryogenics industry, as well as strategic relationships with key industry partners, allowing them to provide unbiased guidance and unique opportunities that help clients thrive. Rutherford & Titan believes its clients deserve a partner who has seen it all – an experienced, trusted pro who can guide them through the tough days and steer them toward success. From selecting and installing a machine to performing ongoing maintenance and sourcing replacement parts, Rutherford & Titan provides a comprehensive range of services, which are available as tiered packages or à la carte offerings. <https://www.rutherfordtitan.com>

SCIENTIFIC INSTRUMENTS, INC.



Scientific Instruments Inc. is a leading manufacturer of measurement solutions for cryogenic applications such as quantum computing, fusion energy, and medical devices. Ranging from temperature sensors, instrumentation and aerospace probes to LNG tank gauging systems, Scientific Instruments, Inc. offers a wide array of high accuracy, high precision solutions to suit the customer's measurement needs. The company has maintained ISO 9001 certification since 1997 and manufactures products to national and international certifications and standards including, but not limited to, FAA-PMA, ATEX, CSA, UL, and IECEx. <https://www.scientificinstruments.com>

SHIROKUMA GMBH



shirokuma GmbH provides consulting services and expertise for systems, processes and components in cryogenics and for the technologies of hydrogen-as-energy-carrier with renewables. Customers benefit from the company's long-standing experience and expertise and a worldwide network. shirokuma GmbH links science and industries by connecting with experts from Swiss and international research organizations while maintaining relations with specific industrial companies. shirokuma GmbH supplies highly specialized consulting services for design, fabrication, testing and qualification of cryogenic components as well as practical problem-solving for technologies and developments in cryogenics for research and industry. Production, storage and the use of hydrogen-as-energy-carrier in a sustainable energy supply cycle are the company's key competencies. shirokuma GmbH services may include strategy consulting, project development, specific studies or qualified product development. <http://www.shirokuma-gmbh.ch>

SIERRA LOBO, INC.

Sierra Lobo is a leader in researching, developing, manufacturing and marketing innovative products and processes for advanced cryogenic storage and thermal insulation systems, thermoacoustic cryocoolers, cryogenic instrumentation and electronics. The Cryo-Tracker® mass gauging system measures and autonomously monitors cryogenic fluid conditions in flight tanks, stationary dewars and road-able dewars. The Cryo-Tracker probe (US Pat. No. 6,431,750) is an ultralight liquid level and temperature sensing probe that provides accurate measurements, independent of liquid type, temperature and tank pressure. The company has the skills and techniques necessary to design, fabricate, test and optimize multi-stage, large-scale pulse tube cryocoolers for applications including liquid hydrogen storage systems, high temperature superconductivity refrigeration, propellant densification, compressed gas liquefaction, cryogenic refrigeration and zero boiloff. Sierra Lobo also offers systems analysis capabilities including cryogenic tank system design and optimization, multilayer insulation system design, cryogenic reactant storage and fuel cell system design, and thermoacoustic codes DeltaE and REGEN 3.2 for pulse tube cryocooler design. <https://www.sierralobo.com>

SIGNAL MICROWAVE



Signal Microwave manufactures field replaceable nonmagnetic SMA and 2.92 mm connectors for quantum computing. The SMA versions have a bandwidth of 27 GHz, and the 2.92 mm versions have a bandwidth of 40 GHz. The first released connectors are SMA male and female field replaceable connectors have a rear socket for 12 mil (.012", .3048 mm) launch pins or glass-to-metal 50-ohm feedthroughs. Materials used for the connectors are phosphor bronze, beryllium copper, Teflon (PTFE), and Ultem. The metal components are plated with 40 microns of gold only. Nickel is magnetic, so it is not used in the applications these connectors are targeting. To handle possible corrosion, the connectors can be replaced with new ones. <http://www.signalmicrowave.com>

SLAC NATIONAL ACCELERATOR LABORATORY



Managed by Stanford University, the Department of Energy's SLAC National Accelerator Laboratory is a multi-program laboratory and a world leader in X-ray and ultrafast science due in large part to its facilities: the Stanford Synchrotron Radiation Lightsource (SSRL), and the Linac Coherent Light Source (LCLS), a pioneering X-ray free-electron laser. SLAC is also home to the Stanford-SLAC Cryo-EM Center and the Facility for Advanced Accelerator Experimental Tests (FACET-II). To support the 700-meter superconducting linear accelerator that will power the LCLS-II upgrade, SLAC relies on two cryoplants capable of providing up to 8.0 kW at 2.0 K of cooling. LCLS-II will put SLAC on the map as one of the largest cryogenic facilities in the world. Cryogenics are also instrumental to the lab's development of detectors and sensors for technological innovation and fundamental physics experiments that probe the origin and nature of the universe, including SuperCDMS, LUX-ZEPLIN, and Cosmic Microwave Background-Stage 4 (CMB-S4). <https://www6.slac.stanford.edu>

SPACE DYNAMICS LABORATORY



The Space Dynamics Laboratory (SDL) is a nonprofit research corporation owned by Utah State University. Founded in 1959, SDL has been responsible for the design, fabrication, and operation of sensors on more than 430 payloads, ranging from aircraft and rocket-borne experiments to space shuttle experiments and satellite-based sensor systems. SDL is AS9100D and ISO 9001:2015 certified. The Laboratory has been pioneering thermal straps since 1994, offering extensive testing services, including conductance, stiffness, vibration, outgassing and cleanliness. The company's thermal straps have decades of spaceflight heritage. SDL is proficient in the design, fabrication, and testing of active and passive differential CTE thermal switches tailored to specific thermal needs. It has extensive experience in designing, fabricating, and installing both flight and ground MLI blankets, specializing in high-performance blankets to cover complex geometry, and is expert in designing, fabricating, and installing isolation systems. <https://www.sdl.usu.edu/capabilities/thermal-straps-and-technologies>

SPECTRUM CONTROL



For more than 70 years, Spectrum Control has led the way in developing reliable, high performance technologies for powering and conditioning RF and microwave signals and protecting electronic equipment from electromagnetic interference. The company continues to push the limits of what is possible today, innovating in material science, design engineering, and manufacturing technologies. Eliminating thermal noise in a quantum computing installation demands a high degree of innovation and reliability. Spectrum Control's experience delivering custom components for use in harsh environments, like space, is the foundation supporting its work in cryogenic technology. Using in-house resistor fabrication processes and materials, Spectrum Control is able to optimize the resistor material, substrate and fabrication processes as well as the mechanical design needed to offer a "thermally quiet" attenuator solution at mK temperatures without superconducting. Spectrum Control offers standard and custom resistive solutions in a variety of dB values, in both coaxial and thin-film SMT packaging. <https://www.spectrumcontrol.com>

Supplier Profile

SPS CRYOGENICS BV



SPS Cryogenics BV designs, manufactures and supplies complete vacuum insulated pipeline systems worldwide for liquid gases: LIN, LOX, LAR, LNG, LHY, LHE, CO₂ and more. As needed, SPS incorporates vacuum superinsulated tees, elbows, phase separators, valves or flexible hoses into the customer's system. SPS meets all safety codes (P.E.D. rules/rules for ships) and delivers within budget and on time. The company provides worldwide service and technical support 24/7. A high level of reliability and customer satisfaction is guaranteed. SPS Cryogenics BV is ISO 9001:2015 and VCA* 2008/5.1 certified. <https://sps-cryo.com>

STAR CRYOELECTRONICS



STAR Cryoelectronics, founded in 1999, is a leading supplier of advanced LTS and HTS dc SQUID sensors, including single- and two-stage current sensing SQUID amplifiers, thin-film as well as wire-wound SQUID magnetometers and gradiometers, standard and custom cryocables (using bundled twisted pairs or woven looms), and easy-to-use PC-based SQUID readout electronics. STAR Cryoelectronics also produces the popular Mr. SQUID®. Educational Demonstration System, used at many colleges and universities worldwide. In addition, the company offers extensive custom LTS and HTS thin-film design and foundry services for a

wide range of superconducting electronics applications. STAR Cryoelectronics also offers turnkey, cryogen-free ADR cryostats with cooling to <50 mK. These cryostats may be configured with TES microcalorimeter detectors and two-stage SQUID amplifier readouts for X-ray microanalysis applications, or with STJ detector arrays for X-ray absorption spectroscopy at soft X-ray synchrotron beamlines. <https://starcryo.com>

STIRLING CRYOGENICS BV



Celebrating its 70th anniversary in 2024, Stirling Cryogenics has supplied more than 4,000 cryogenic systems with more than 6,000 cryogenerators across the globe. The Stirling Cryogenerator was developed in the 1950s and has been the cornerstone of Stirling's systems ever since, producing cooling power at temperatures ranging from 200 down to 15K. Depending on the application, Stirling's cryogenic systems are designed to provide cooling power for the task at hand, based on one of its cryogenerator types. Stirling Cryogenerators are available as (re-)liquefier for the production of cryogenic liquids such as nitrogen,

oxygen, methane, hydrogen or argon. In closed loop cooling systems, the Cryogenerators act as coolers of a cold flow of gas or liquid, being pumped through the application by our own product range of CryoFans and CryoPumps. In 2023, the company established its US sales office named Stirling Cryogenics Inc. to support its USA and Canadian customers. <https://www.stirlingcryogenics.eu>

STÖHR ARMATUREN



Stöhr Armaturen GmbH & Co KG has specialized in the development and manufacture of cryogenic valves for liquefied industrial gases for use in research institutions, the industrial gas industry, aerospace, marine engineering and hydrogen technology since the 1960s. Cryogenic temperatures down to 2 K or below, high pressure up to 1,000 bar while sealed with bellow, high leak tightness, compatibility with corrosive, flammable or toxic media and short shutter speed characterize the company's products. Stöhr's standard product range comprises valves for both ambient and cryogenic temperatures, with highly precise control valves, shut-off

or check valves for installation in valve boxes, fitted in vacuum jackets or regular installation into pipes; relief valves, overflow valves and filters – all made of stainless steel and sealed with bellows. In addition, special valve designs for specific customer requirements are available. <https://www.stoehr-valves.de/en>

SUMITOMO (SHI) CRYOGENICS OF AMERICA, INC.



SHI Cryogenics Group, an integral part of the Precision Equipment Division of Sumitomo Heavy Industries, Ltd., is a leading worldwide provider of innovative cryogenic and vacuum solutions to the medical, semiconductor, flat panel, general coating and research industries. With offices in Asia, Europe and the United States, it has been producing quality cryogenic equipment for more than 50 years. SHI's renowned research and development departments continue to focus on the latest cryogenic and vacuum technologies, including innovative cryopump and cryocooler designs. Sumitomo (SHI) Cryogenics of America, Inc. (SCAI)

is the North American Division of the SHI Cryogenics Group, focusing on design, manufacturing, sales and service with its corporate office in Allentown, PA, and additional locations in Illinois, California and Texas. <https://www.shicryogenics.com>

SUNPOWER, INC.



Sunpower's CryoTel® cryocoolers are the result of over 40 years of technical leadership, innovation and evolution in free-piston Stirling technology. Their cryocoolers are cost-effective, exceptionally quiet, low in vibration and extremely efficient. Since they require no maintenance, customers can expect many years of high performance, trouble-free cooling. For temperature requirements between 40 K and 200 K, CryoTel presents an alternative choice in terms of small size, efficient operation and price. <https://www.sunpowerinc.com>

SUPERPOWER INC.



SuperPower Inc. is a world-leading developer and producer of REBCO-based second-generation high temperature superconducting (2G HTS) wire that provides a variety of advantages over conventional electrical conductors: high efficiency, high strength, higher energy density and superior performance in magnetic fields. Electric and electromagnetic devices incorporating 2G HTS wire are smaller, lighter, cleaner, smart grid compatible, and reliable. Areas of application include energy industries, medical technologies, transportation, military, aerospace, and scientific research. In addition to the enabling HTS wire, SuperPower also offers 2G HTS-

based magnet coils and current leads designed and built to customer specifications. Established in 2000, SuperPower is a wholly owned subsidiary of Furukawa Electric Co., Ltd. Their mission is to be the world's leading commercial provider of state-of-the-art superconducting wires and related devices. <http://www.superpower-inc.com>

TECH4IMAGING LLC



Tech4Imaging is an engineering and research firm established in 2007 as a spinoff from The Ohio State University. The company is at the forefront of capacitance-based measurement and imaging technology. Capacitance sensors have the unique advantage of providing non-invasive measurements in real-time speeds with minimal heat injection. In 2012, the first commercialized Electrical Capacitance Volume Tomography (ECVT) system for imaging and measuring solid holdup in gas-solid systems in room temperature applications was released. The technology capability was extended to hot flow applications by introducing sensors that can withstand high pressure and high temperature conditions. The technology further developed from gas-solid applications to include water and steam applications by adding a new measurement dimension to the same set of sensors. Most recently, cryogenic fluids have been added to the company's technology applications and are attracting serious attention from industry and multiple government agencies. <https://www.tech4imaging.com/>

TECHNIFAB PRODUCTS, INC.



Technifab Products, Inc. specializes in the transfer, storage and control of cryogenic fluids. The Cryogenic Division manufactures vacuum jacketed pipe, manifolds and transfer hoses to efficiently deliver cryogen. A full turnkey operation, it offers innovative solutions for challenging applications, expert system installations and custom-designed equipment fabricated to specifications. The high quality equipment meets and exceeds industry standards, including ASME and Canadian registration numbers. The product line features liquid helium equipment, valves, phase separators, tank switchers, injectors, and monitoring equipment to transfer liquid nitrogen, oxygen, CO₂, helium, hydrogen, argon and LNG. Technifab CNC Manufacturing specializes in high quality CF and KF flanges, cryogenic components and custom machined parts. The Cryodewar Division stocks laboratory dewars, accessories and personal protective equipment for fast shipment. Since 1992, Technifab's engineering team has designed cryogenic equipment to specific requirements in the aerospace, electronics, food and beverage, medical, pharmaceutical, research and semiconductor industries. <https://www.technifab.com>

TECHNOLOGY APPLICATIONS, INC.



Technology Applications, Inc. (TAI), located in Boulder, CO, supplies thermal straps (also known as "flexible thermal links" or "heat straps"). In addition to thermal strap products, TAI specializes in advanced technology development of cryogenic and thermal management systems for the DOD and NASA, aerospace prime contractors and commercial firms. Specialty products include cryocooler integration and interfaces involving vibration isolation, heat exchangers, and thermal management of electronic components and enclosures. TAI offers custom and 100+ standard model OFHC copper rope straps (made with their exclusive OFHC UltraFlex™ I and II copper cabling), including 72 standard models designed for popular cryocoolers, and straps made of graphite and graphene. TAI also offers gold and nickel plating, as well as uniquely plated aluminum-copper hybrid thermal straps with reduced mass, ideal for defense, spaceflight and airborne applications. TAI provides annual thermal strap catalogs, free strap assessment packages, and free front-end design and consultation services. <https://www.techapps.com/copper-thermal-strap-assemblies>

TEMPSHIELD CRYO-PROTECTION®



Since 1980, Tempshield Cryo-Protection® has been designing and manufacturing personal protective equipment to provide protection from ultracold temperatures. The company offers a complete line of cryogenic gloves, aprons, gaiters, and face shields for use in a wide variety of applications. Tempshield's markets are cryobiology, laboratory research, microscopy, cryogenic gas supply including LOX, the frozen food industry, metal hardening, oil and gas (LNG), semiconductors, telecommunications, and aerospace. With its products in use in over 75 countries, Tempshield is proud of its history and reputation as a premier producer of high-quality cryogenic protective apparel. <https://www.tempshield.com>

THE AEROSPACE CORPORATION



The Aerospace Corporation operates a Federally Funded Research and Development Center (FFRDC) committed exclusively to the space enterprise. Its technical experts span every discipline of space-related science and engineering. The company's mission includes performing objective technical analysis and testing for a variety of national security, civil, and commercial customers. Part of the FFRDC charter is to be a leading technical resource for all space applications. Aerospace has broad expertise in cryocooler/cryogenic technologies and mission applications. With databases that include information on past cryogenic systems and forecasting future capabilities, Aerospace can help ensure mission success for all space-based cryogenic missions and the technologies that support them. With over 80 specialized labs, Aerospace can provide world-class testing, analysis, and troubleshooting for many aspects of cryogenic engineered systems. <https://aerospace.org>

THE PHOENIX COMPANY OF CHICAGO, INC.



The Phoenix Company's focus on blindmate high density microwave contact technology serves customers across quantum, medical, military, test, and telecom markets with a broad range of products and accommodating services. The company's high-density PkZ® contacts provide constant impedance up to 50 GHz over an axial tolerance extending up to .110", making these the preferred selection for microwave blindmate applications. Although Phoenix offers SMA cable assemblies for quantum systems, experiments requiring more lines of data per port gain numerous benefits from the PkZ. Phoenix's high-density microwave contacts, housings, and cable assemblies comprise a full quantum system from external microwave cables through a hermetic header into each level of the dilution refrigerator. The HDQ18, a complete board level microwave solution, enables high density circuit mount PkZs to interface with the quantum processor for connection to existing RF lines. All products are designed and produced in the company's integrated facility in Naugatuck, Conn. <https://www.phoenixofchicago.com>

Supplier Profile

THERMAL MANAGEMENT TECHNOLOGIES



Thermal Management Technologies (TMT) is a small business that provides hardware, thermal-mechanical engineering, and R&D to a diverse space, industrial and research customer base. TMT provides efficient hardware and design solutions including multifunctional heat-spreading structures, radiators, isolators, flexible thermal straps constructed of either ultraflexible copper rope or compact flexible metal foil straps using either aluminum or copper, phase-change-material thermal storage heat sinks, and custom heat exchangers, as well as many other custom integrated thermal-mechanical heat spreading or thermal isolation systems. The company's engineers work with customers to define their needs and propose solutions based on extensive experience with cryogenic, vacuum and thermal systems. Need some standard hardware, a unique solution, or help solving a challenging problem? Contact TMT to work

together toward a fully integrated solution. <https://www.tmt-ipe.com>

THERMAL SPACE LTD.



Thermal Space Ltd. provides component and turnkey thermal management solutions, specializing in cryogenic systems. From thermal straps, radiators, and cold plates to custom dewars and cryostats, the company provides design, analysis, hardware fabrication, cryo-vac and mechanical testing, and integration support services. Its engineering team has 30+ years average experience in space cryogenic systems and was the first to develop space-qualified thermal straps from aluminum, copper and graphite materials for exceptional performance in all environments. Thermal LyNX® straps use advanced graphene technology

and offer the highest thermal performance-to-weight ratio. The company's copper and aluminum thermal straps are globally recognized for both quality and performance. Also offering thermal testing, stiffness testing, thermal and fluid analysis, Thermal Space strives to be your single source for solving and implementing effective and reliable cryogenic and thermal management solutions. <https://www.thermal-space.com>

THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY (JEFFERSON LAB)



The primary mission of Thomas Jefferson National Accelerator Facility (Jefferson Lab) is to enable basic research to build a comprehensive understanding of the atom's nucleus. Laboratory staff and an international user community of scientists and students, more than 1,500 strong, study protons and neutrons and their constituent quarks and gluons, using the lab's unique particle accelerator, known as the Continuous Electron Beam Accelerator Facility (CEBAF). Managing and operating the lab for DOE is Jefferson Science Associates, LLC, a limited liability company comprised of the Southeastern Universities Research

Association. Multiple helium refrigeration plants ranging from 180 W at 4 K to 4,600 W at 2 K support research at the laboratory. A focus on improving capital equipment costs, system efficiencies and applied cryogenic helium refrigeration engineering R&D is conducted by the Cryogenic Department staff through collaborations with industry, other national laboratories and government agencies. <https://www.jlab.org>

TRIUMF



TRIUMF is one of the world's leading subatomic physics laboratories. It brings together dedicated physicists and interdisciplinary talent, sophisticated technical resources and commercial partners in a way that has established the laboratory as a global model of success. Its large user community is composed of international teams of scientists, post-doctoral fellows and graduate and undergraduate students. The advances ensuing from TRIUMF's research will enhance the health and quality of life of millions of Canadians, launch new high-tech companies, create new high specificity drugs, help us understand the environment, enable the

development of new materials and spur the imaginations of our children, who want to know their place in the universe. <https://www.triumf.ca>

TURBINES INC.



Turbines, Inc. was founded in 1975 with a vision to manufacture high quality, American-made flow measurement instruments supported by excellent customer service and prompt delivery. Turbines, Inc. has transformed this vision into reality by utilizing the latest manufacturing techniques, advanced CNC equipment, and its expertly trained and committed staff. The company's cryogenic flow products are recognized as a standard-bearer for quality, service, custom application engineering and prompt delivery, serving all tiers of the cryogenic market. Its cryogenic turbine flow meters, monitors and accessories are designed

specifically for low temperature applications including but not limited to bulk and micro-bulk transports. These cryogenic products meet the performance standards and demands of leading liquefied gas producers and distributors by providing unmatched quality, reliability, and accuracy. They are CTEP and NTEP, CRN, OIML R81, R117 and MID certified. Dedicated field service support and recertification are offered for cryogenic flow meters, including competitors. <https://www.turbinesincorporated.com>

VACUUM BARRIER CORPORATION



Since 1958, Vacuum Barrier Corporation (VBC) has designed, engineered and fabricated LN₂ piping equipment and components to provide custom and standard solutions for all LN₂ applications. VBC's equipment includes vacuum jacketed flexible SEMIFLEX®/Triax LN₂ piping, a complete line of NITRODOSE LN₂ dosing systems, modulating and sensor controlled phase separators, NITROMATIC dewar fill station and other specialized equipment. The company is ISO 9001:2015 certified, confirming their high-quality equipment continually meets or exceeds industry standards. VBC's highly skilled team of technical application

engineers strives to be a one-stop source for a complete LN₂ handling system, assisting clients within the semiconductor, MBE, food and beverage, pharmaceutical, biotech and other industries. VBC, a US-based company, provides sales and service to companies worldwide by working with a select group of distributors. <https://vacuumbarrier.com>

VACUUM ENERGY INC.



Vacuum Energy Inc. is the exclusive manufacturer of getters using Sandia's proven polymer hydrogen getter technology. The company has spent decades collaborating with Sandia National Laboratories to develop innovative new classes of hydrogen absorbing materials for use in demanding applications where conventional getters are unsuitable. The PolyGetter™ technology developed for cryogenic vacuum insulation systems provides numerous benefits for the company's customers, meeting needs for applications from pipe insulation to high capacity liquefied gas storage and transportation systems. Benefits include: no additional processing or activation – getter is ready to use; high capacity for hydrogen (from 50 to >250 cc/g); reliable, cost-effective getter performance; off-the-shelf or custom form factors; and getter variants to meet specific application requirements, including LOX-compatible options. No matter how large or small, Vacuum Energy welcomes all cryo getter enquiries. <https://www.vacuumenergyinc.com>

VALCOR SCIENTIFIC



Valcor Scientific, a business unit of Valcor Engineering, offers a wide range of solenoid valves for general purpose, high purity, and cryogenic applications. Designed for durability and long life, some proprietary designs offer all-welded construction that is ideal for service at liquid helium temperatures (-452 °F). Unique design features offer extended life in high-cycle applications, in a compact envelope. The general service cryovalves are used for GC column cooling, dewar transfill, and environmental chamber cooling. Other applications include lyophilization and cold temperature product testing. <https://www.valcor.com/scientific-and-industrial>

WEB INDUSTRIES, INC.



When facing pressure to build and launch faster or protect precision cryogenic equipment, you need to overcome technological and manufacturing barriers quickly. With a 25-year history of thermal insulation and soft goods excellence, Web Industries is here to accelerate its customers' programs. The company has spent decades eliminating production and supply chain burdens for multilayer insulation (MLI) and soft goods manufacturing. The company's design and process experts offer unmatched experience transitioning between software-driven 3D and 2D flat patterns. Web's production specialists utilize a variety of human/machine hybrid and automated processes in AS9100D and ISO 9001-certified facilities to sew and finish complex 2D and 3D assemblies from thin films and high value materials. Pushing the limits of the latest CAD and CNC tools, Web's precision-manufactured MLI and soft goods provide a custom fit to any fixture and geometry and offer exceptional performance, ease of installation, simplified procurement, and unique affordability. <https://www.webindustries.com>

WEKA AG



WEKA is a Swiss SME with more than 40 years of developing and manufacturing experience. It is a leading manufacturer of instruments for liquid level measurement as well as a specialist in cryogenic components and highly sophisticated valves. WEKA cryogenic components provide optimal solutions for handling low temperature liquefied gases under extreme conditions. Components are used in applications involving liquid and gaseous media below 120 K (153 °C /-243.8 °F) down to 0.4 K (-272.75 °C /-458.95 °F). The manufacturing program for cryogenic components includes cryogenic shut-off and control valves for installation in valve boxes or fitted in vacuum jackets; special types of cryogenic valves; check, pilot and overflow valves; coupling systems for cryogenic transfer lines (Johnston and multi-coaxial); compact valves for space cryogenic systems; LH₂ valves for H₂ mobility applications; custom-designed cryogenic components (e.g., cryostats, cold ejectors, prototypes); and stainless steel needle valves for high corrosive and low temperature applications. <https://weka-ag.ch/en>

WESSINGTON CRYOGENICS, LTD.



Wessington Cryogenics is an engineering-led, solutions-driven and customer-focused producer of cryogenic vessels. Founded in 1984, this UK-based company began by providing small tanks for industrial and medical research applications. Almost 40 years, and tens of thousands of tanks later, Wessington now operates from a 70,000-sq.-ft. facility where its 130+ employees deliver vessels all over the world. The organization has a wide range of products which includes bulk storage tanks, liquid helium dewars, self-pressurizing vessels, ISO containers and road tankers, among others. These are joined by an ever-increasing range of services including custom designs, repairs and refurbishments as well as the provision of spares and accessories. A company with a proud pedigree of engineering innovation, Wessington's special projects are among some of the most interesting in the cryogenics field, including bespoke vessels for use in particle physics, 'Around the World' ballooning records, hydrogen and other green energy cryogenic applications. <https://wessingtoncryogenics.com>

WEST COAST SOLUTIONS



Founded in 2015 by Dr. Carl Kirkconnell, WCS has rapidly emerged as a technology and thought leader in the development of next generation cryogenic technologies. The backbone of the team is a group of former Hughes/Raytheon colleagues with decades of demonstrated success together. In the company's short history, WCS has already notched dozens of wins in cryogenics, space electronics, and power technologies, developing innovative and disruptive solutions for NASA, Missile Defense Agency, and numerous commercial customers. While the company supports a range of cryogenics applications, their present focus area is new space, characterized by small, cost sensitive payloads. They are presently performing on several small satellite technology programs where they are developing next-gen Stirling cryocoolers, control electronics and CubeSat cryocooler systems. WCS has also developed a number of custom, highly specialized commercial cryogenic system designs utilizing both closed-cycle coolers and liquid nitrogen dewars. <https://wecoso.com>

Supplier Profile

XMA CORPORATION

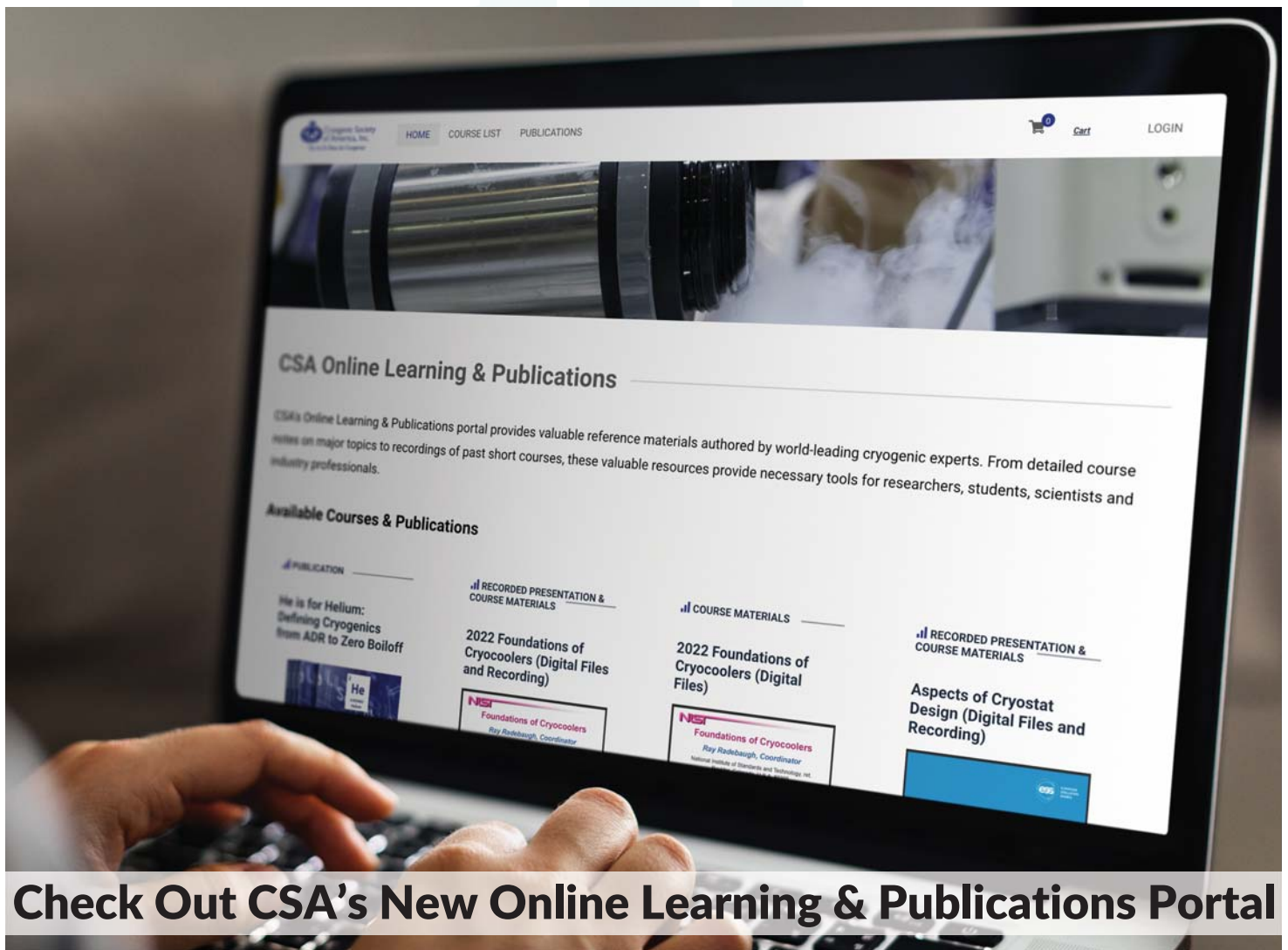


XMA Corporation is a world leader in coaxial interconnect technologies for passive RF solutions. The company was created in 2003 with the goal to continue the legacy of Omni Spectra®. With a commitment to quality and a progressive focus on cryogenic, high frequency, and space qualified products, XMA delivers new solutions to its customers, one connection at a time. Since its beginning, XMA has differentiated its products by mastering a resistive “thin-film” hybrid, a proprietary resistor that allows components to perform under extreme conditions. This unique technology makes the company’s components vital in cutting-edge cryogenic microwave solutions. Today, XMA offers new coaxial components made to disrupt the industry and advance RF technology. They continue to create contemporary standard and customized solutions for some of the most advanced communications, quantum and aerospace applications. <https://www.xmacorp.com>

ZEROAVIA



ZeroAvia Inc is a sustainable aviation company that develops and produces electric aviation solutions for short-haul commercial air transportation. The company aims to provide clean and efficient air travel, reducing the environmental impact of aviation while improving the overall passenger experience. They have developed hydrogen electric propulsion systems for small aircraft and are working towards making hydrogen electric air travel a commercial reality. <https://www.zeroavia.com>



Check Out CSA's New Online Learning & Publications Portal

The Cryogenic Society of America's new Online Learning & Publications portal provides valuable reference materials authored by world-leading cryogenic experts. From detailed course notes on major topics to recordings of past short courses, these valuable resources provide necessary tools for researchers, students, scientists and industry professionals. This Online Learning & Publications portal will be updated regularly with new content. Check back often to see what's available!

Start Learning! <https://cryogenicsociety.mclms.net/en>